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MARCH

ALL-PURPOSE 6000-HP LOCOMOTIVE

NEWEST TRICKS OF THE G-MEN by J. Edgar Hoover

IN FULL COLOR—MINIATURE TRAINS GO TO TOWN

It's easy to build and fly

this P-47 control-line model

IF YOU'VE never built and flown a gas-powered flying model airplane, you've got a real thrill coming. There are few hobbies or sports as interesting and fascinating. You'll get real satisfaction and pride in turning out a clean cut, good looking model. And when you warm up the engine and she takes off under your own control—brother, that's fun!

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Each month, MECHANIX ILLUSTRATED features the best in gas-powered models, and full-size plans are made available through your model or hobby shop. Every plan is complete to every last detail with easy-to-follow diagrams, step-by-step instructions, exploded views and explicit directions.

This month the feature model is the famous P-47 Thunderbolt. This 20-inch exact-scale model flies equally as well as its full-size counterpart. And she's just as rugged and dependable. The P-47 is a particularly good project for beginners because the design calls for practically all solid balsa construction. So be sure to read the details in the feature story on pages 136-140 of this issue.

For the most fun in building and flying model airplanes, look for this MECHANIX ILLUSTRATED plan package at your hobby shop. It means the latest and the best in gas-powered jobs. Only 50 cents. If your dealer can't supply you yet, order plan #375 direct from the MECHANIX ILLUSTRATED Reader Plan Service, Greenwich, Connecticut and include the name and address of your dealer.

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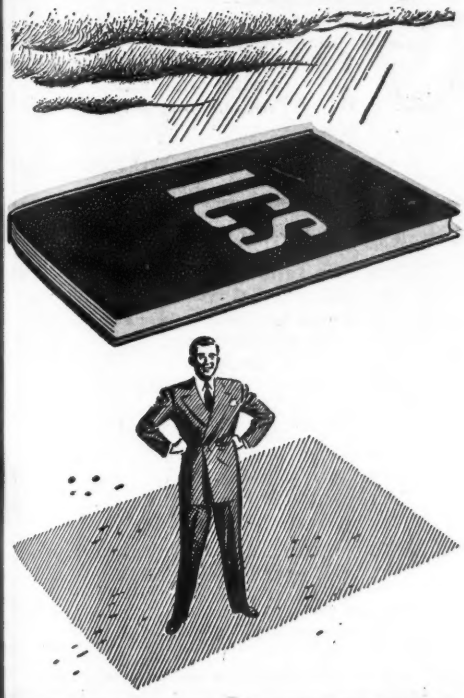

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MARCH, 1947 — VOL. XXXVII, No. 5

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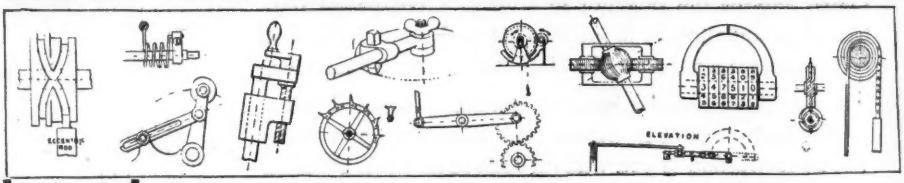

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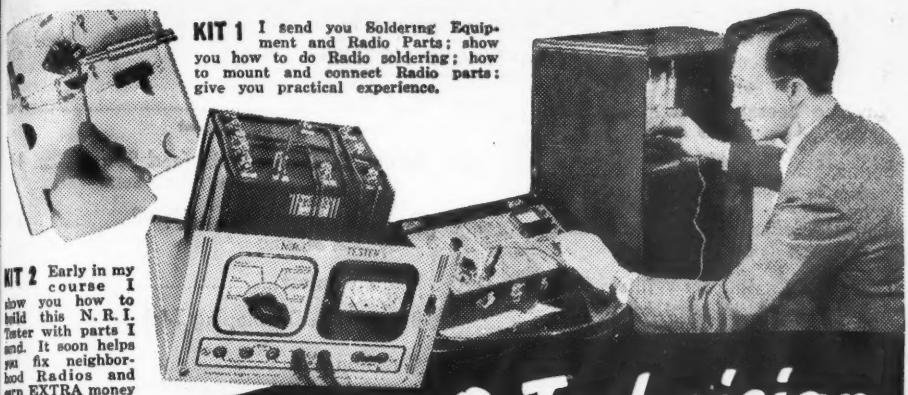

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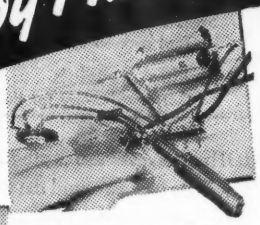

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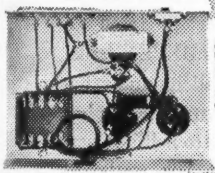

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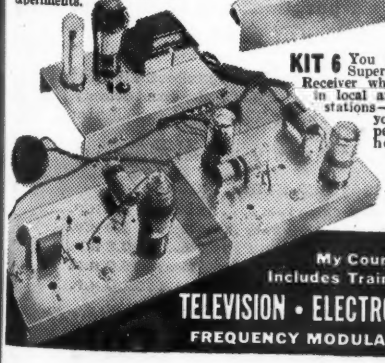

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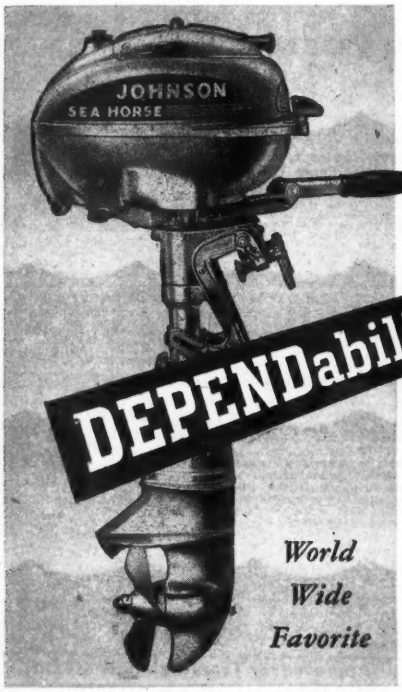

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SO IT NEEDS FIXING

By S. T. CHRISTENSEN
the "Fix-it Man"

"WELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add, has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

What to Charge?

At first, I let the owner decide the charge and frankly, I was amazed at what I earned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some jobs) were a little difficult to get. But that situation quickly adjusted itself and many repair parts were given the high priority rating of AA2. After all, we had to provide for the health and well-being of our civilian population.

The Future Offers

Friends ask me about my future. And, I think I've got a grand one. Age is no handicap in repairing. I have in my files enthusiastic letters from repairmen ranging in age from 18 to 79 years. Now the war is over we are certain to see hundreds of new products on the market . . . products that the average person never dreamt of. These new products and our old appliances are all going to need at some time or other "fixing." Well, I'll still be the fellow to do it. The field open for appliance repairmen is unlimited. I don't worry at all about too much competition.

If You Are Ambitious

To the contrary, I've prepared a complete course, chuck full of simple, easy to understand photos and drawings and written in the same non-technical language as this article. I know the course is good, because I have hundreds of men all over the country writing to me telling me how the course has helped swell their pockets with cash. If you too want to prepare now for your future, I suggest you read the next page and send me the handy coupon."

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BIG MONEY INDEPENDENCE

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LEARN ELECTRICAL APPLIANCE REPAIRING

PREPARE NOW FOR THE FUTURE

If now employed, start your home appliance repair business NOW in your spare time and be set with a business of your own no matter what happens. You don't need elaborate fixtures or expensive equipment to be a successful repairman. Operate from your garage, basement, vacant store, etc. Work as many hours as you wish—the home appliance repairman is his own boss. It is a profitable occupation for on many types of repairs it is not unusual for a repairman to charge on the basis of $5.00 to $6.00 per hour. Don't gamble with your future—learn a trade that will always support you. Remember, as long as electrical appliances are used, there will be a need for electrical appliance repairmen.

If you are at all mechanically inclined—can hold and use tools—then you have all of the qualifications required for becoming a big money earning home appliance repairman. It does not matter if you have not had a great deal of schooling or had previous experience along these lines—WE, WILL TEACH YOU. Age should be no barrier—nor should any minor physical handicap.

New Course Tells All

Profusely illustrated, our new course shows you in simple, easy to understand language and drawings how to make each repair on refrigerators, vacuum cleaners, washing machines, motors, etc. Explains and gives you a working knowledge of electricity, welding, nickel plating, etc. Shows you how to build the power tools you need and how to solicit and keep business coming to you. Not a theory course but an honest to goodness course written by and used by repairmen the country over. Price of course is so low that the savings on your own household appliance repairs will quickly pay for it. Act now! Mail the handy coupon below today.

Read What Our Students Say About Course

I really believe your course the best investment a mechanically minded man can make.—Claude E. Allen, Indianapolis, Ind.

I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—P. J. Breti, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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Please attach letter stating age, occupation, employer's name and address, and name and address of at least one business man as reference. Men in service, also please give home address.

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Give me just this and I'll prove I can make you

A NEW MAN!

I'M "trading-in" old bodies for new! I'm taking men who know that the condition of their arms, shoulders, chests and legs—their strength, "wind," and endurance—is not 100%. And I'm making NEW MEN of them. I'm giving them the kind of powerful, healthy HE-MEN build that spells SUCCESS in life and business.

Charles Atlas

—actual photo of the man who holds the title, "The World's Most Perfectly Developed Man."

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Are you ALL MAN—tough-muscled, on your toes every minute, with all the up-and-at-'em that can lick your weight in wildcats? *Or do you need the help I can give you*—the help that has already worked such wonders for other fellows, everywhere?

All the world knows I was ONCE a skinny, scrawny 97-lb. weakling. And NOW it knows that I am the holder of the title, "The World's Most Perfectly Developed Man." How did I do it? How do I work miracles with the bodies of other men in only 15 minutes a day? The answer is *"Dynamic Tension,"* the amazing method I discovered and which changed me from a 97-pound weakling into the champion you see here!

In just 15 minutes a day, right in the privacy of your own home, I'm ready to prove that *"Dynamic Tension"* can lay a new outfit of solid muscle over every inch of your body. Let me put new, smashing power into your arms and shoulders—give you an armor-shield of stomach muscle—strengthen your legs into real columns of surging stamina. If lack of exercise or wrong living has weakened you *inside*, I'll get after that condition, too, and show you how it feels to LIVE!

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I want the proof that your system of *"Dynamic Tension"* will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength."

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☐ Check here if under 16 for Booklet A.

$3500 In Prizes For Photos

The Second Annual National High School Photo Contest began on February 15 The contest is open to all students in any public, parochial, or private high school in the United States. The highest individual prize offered by the sponsors, the Eastman Kodak Company, will consist of $600. Judges will include actress Helen Hayes, artist Norman Rockwell, and Kenneth Williams of the Kodak Co. The closing date is May 15.

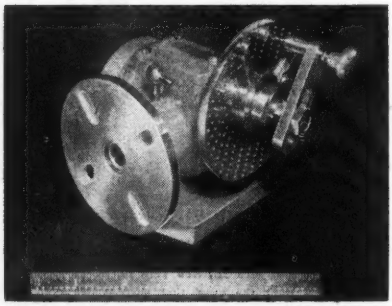
Vein Thermometer

Blood temperatures may now be measured directly in the blood-stream itself by means of a new electric thermometer.

The minute, sensitive part of the apparatus, known as a thermistor, is embedded in a glass bead only one twenty-fifth of an inch in diameter. This in turn is encased in the tip of a rubber tube so slender that it can be pushed through a hollow needle inserted into a blood vessel.

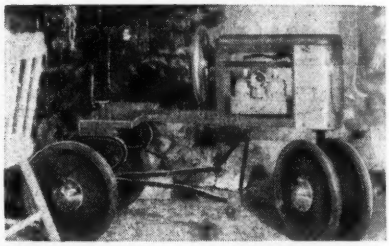
From the thermistor a pair of slender wires lead back to a small box containing apparatus for measuring changes in electrical resistance. From these changes, the blood temperature can be determined within a range from 97 to 133 degrees F.

MINIATURE DIVIDING HEAD



Philip Duclos of Bell, Cal., built this universal dividing head in order to be able to make the gears for a special miniature camera he designed. To make the gears he needed a miniature dividing head. But in order to be able to use the dividing head he had to also make a miniature milling machine. A $10.00 Workbench Award is on its way to you for your precision workmanship. Hope you won't have to make the film to fit your camera, Philip.

FROM MI PLANS



We're sending Kenneth M. Eddy of Canastota, New York, a $10.00 Workbench Award for the tractor he built for his youngster. Plans for this tractor originally appeared in the November 1945 issue of MECHANIX ILLUSTRATED. Gears from an old breast drill were pressed into service, with ball bearings for all the wheels. It really looks like a sturdy toy, something that Kenneth Jr. will be using for a long time.

Snow-proof Road

There's at least one roadway in the U. S. that's not bothered by snow and ice that ordinarily would block or slow traffic. It's a 600-foot-long road that has hot-water pipes embedded in the concrete to keep it clear.

It's a two-lane affair between the local plant of the American Cyanimid Co. and a main thoroughfare. The road has a constant upgrade which snow and ice can make virtually impassable, so the hot-water melting system was thought up and installed.

Eight black wrought-iron pipes have been embedded in the road's eight-inch concrete, providing two pipes 18 inches apart beneath each wheel track. Through these 600-foot pipes will run approximately 50 gallons of water per minute at an average temperature of 165 degrees Fahrenheit when snow or ice threaten to form on the road.

The system can remove one inch of snow or one-tenth of an inch of ice in an hour under maximum operating conditions.

Invisible Beacons

Invisible, static-free, very high frequency (VHF) radio beams will soon take over the task of guiding transport planes over their skyways. VHF radio beams will be useful, too, in cloudy and foggy weather as well as at night.

Radio ranges and lights are at present the back-

[*Continued on page 14*]

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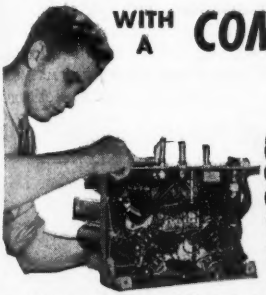
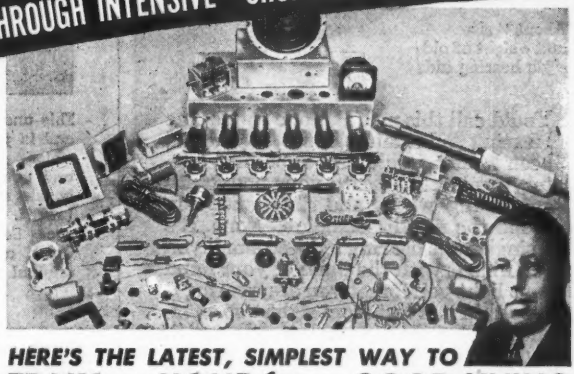


YOU LEARN RADIO SERVICING THROUGH INTENSIVE "SHOP-BENCH" PRACTICE



YOU DO EXPERIMENTS, CONSTRUCTION, TROUBLE-SHOOTING

I'll show you how to perform over 175 instructive Experiments—how to build countless Radio Circuits. You'll learn a new, fast way to test Radio Sets without mfg. Equipment.

I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional accuracy and speed.

You'll get valuable experience and practice building this Signal Generator and multi-purpose Tester. Makes a breeze out of fixing Radios and you don't have to spend money on outside, ready-made equipment.

Soldering, wiring, connecting Radio parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter, Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.

HERE'S THE LATEST, SIMPLEST WAY TO TRAIN at HOME for a GOOD LIVING in RADIO-ELECTRONICS & TELEVISION

I train your *mind* by putting you to work with your *hands* on a big 6-Tube Superheterodyne Receiver. And, believe me, when you get busy with real Radio Parts — 8 big Kits of them — you really LEARN Radio and learn it RIGHT! You get the practical stuff you need to be *useful* in Radio, and that's what it takes to make money. You don't have to worry about what to do with these 8 Kits of Parts. Step by step, I show you how to build circuits, test, experiment, trouble-shoot. And you don't need any previous experience. The Sprayberry Course starts right at the beginning of Radio! You can't get lost! Simplified lessons, coupled with real "Shop" practice, makes every subject plain and easy to understand and remember.

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Soon after you begin Sprayberry Training, I'll send you my sensational BUSINESS BUILDERS. You'll find out how to get and do neighborhood Radio repair jobs for nice profits and rich experience while learning. This sort of work can easily pave the way for a Radio Service business of your own. But with Sprayberry Training, you're not limited. You can swing into any one of the swiftly expanding branches of Radio-Electronics INCLUDING Radio, Television, FM, Radar, Industrial Electronics. Be wise! Decide now to become a fully qualified RADIO-ELECTRONICIAN. Get full details about my Training at once! Mail coupon below for my 2 big FREE Books.

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You'd call this new Beltone Mono-Pac Hearing Aid a miracle, too, if you had been wearing a clumsy, annoying, battery pack strapped to your body with entangling wires, and then suddenly found the new Electronic Beltone. It's a single-unit hearing aid—so small you can hide it with the palm of your hand—so light you forget you are wearing it—so thin it is lost from sight—so efficient you bless the day you learned about it.

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Editor's Workbench Chips

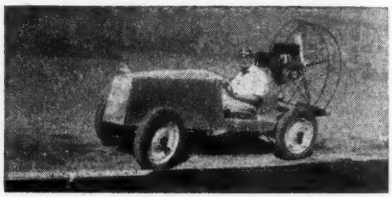
[*Continued from page* 12]

bone of the 40,000 miles of federal airways and will continue to be important for private planes not equipped for radio beam receiving.

Already nine complete airways are being developed with four-course aural visual ranges in a high frequency band. One has been in successful use since early last spring, and others are nearing completion. They are substantially free from static.

The new VHF transmitters will be stationed along airways at intervals of about 100 miles. The type being installed, called omnidirectional, shoots signals in all directions. The present low frequency signals are shot only in four directions.

PROPELLER-DRIVEN AUTOMOBILE



This unusual car is built on an Austin chassis and is powered with a 27 hp Heath Aircraft motor. It does about 30 miles to the gallon and can hit 70 miles on the open road. It boasts a foot throttle control and four-wheel brakes. We are only too happy to send Clarence Schaefermeyer of Steamboat Springs, Colo., a $10.00 Workbench Award for this original project.

Bump in the Air

Here's one for the book (we found it in the Civil Aeronautics Journal):

Kenneth W. Alexander, pilot, took Doris Thurman for a ride. While circling over Queen City, Missouri, he turned to talk to his passenger. Upon noting that the plane's nose had risen and its air speed dropped (the set-up for a spin), he quickly pushed the stick forward and gave full throttle, then pulled the stick back.

This was correct, but he was used to heavier planes, and his motions were too abrupt. His head hit his passenger's head—conck! Both went into dreamland. While they were unconscious the plane flew itself into the ground under full power. The passenger came to shortly after the impact, the pilot an hour later. Their injuries were minor.

See in the Dark

A new "see-in-the-dark" device, expected to help humans to see as well as bats and owls, or even better, has been invented by Russell H. Varian, research engineer.

The "image intensifier," as he calls it, is intended to make clearly visible objects in light too

[*Continued on page* 16]

MEN FROM 16 to 40! In fairness to Your Future, find out what COYNE offers in Practical "Learn-By-Doing" Training!

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...MAIL THIS TODAY!

Editor's Workbench Chips

[*Continued from page* 14]

dim for good seeing. It can also be operated on either infra-red or ultraviolet radiations. The basic idea is the focussing of the visual image on a photoelectric grid by means of a lens. The electrical impulses thus produced are amplified as much as necessary, then fed into a suitable image-producing vacuum tube for re-conversion into visible pictures. The device can be used either for direct viewing or in television. Interposition of synchronized rotating disks carrying filters, before both objective lens and viewing screen, can produce colored images if desired.

SMOOTH GOIN'

Herbert A. Heisel of Moline, Ill., built this trim looking kayak in the backyard of his home. Though the boat is now several years old, it continues to give yeoman service in hunting, fishing and just plain fun afloat. A $5.00 Workbench Award is on the way to Mr. Heisel.

Transparent Violins

Now, violins, clarinets and other musical instruments are made of a transparent plastic that was used extensively for bomber noses and gun turrets during the war. It is an acrylic plastic, easily molded and light in weight. The instruments have good tone, and are unaffected by weather changes.

Sun Still High-Balling

A new star-gazing study has uprooted the basis for determining the speed at which the sun travels in its orbit through the Milky Way.

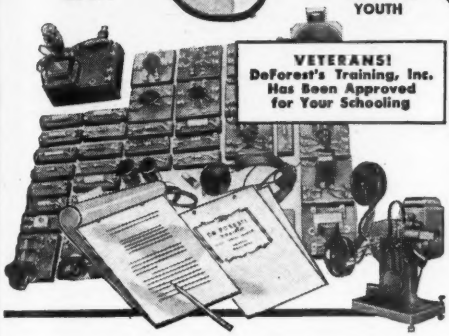
But it's nothing to worry about. The sun is still high-balling at the same speed as the early estimates claimed. Luckily, they called the turn accurately.

The new facts were learned in observations of 50 globular star clusters—great spherical stellar concentrations which pepper the heavens out to the edge of the galaxy.

Scientists explained that the sun's speed has always been estimated by observing its position relative to a few of the globular clusters. It was

[*Continued on page* 18]

Let Us Show You How to Prepare
TO MAKE REAL MONEY QUICKLY!!



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Our Home Study or Residence courses, thorough in every detail, offer a unique combination of training advantages. We furnish you with a 16 millimeter Motion Picture Projector and 12 reels of valuable movie film. You also use 8 big kits of Radio-Electronic parts as shown on this page, enabling you to work out 133 MODERN EXPERIMENTS for valuable practical experience.

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Jerry, the talking dog, is entertaining hospitalized veterans, by courtesy of the PYROIL Company. Picture of Jerry, sent on request.

Editor's Workbench Chips

[*Continued from page* 16]

assumed in these calculations that the clusters did not rotate.

But these "island universes" do rotate slightly, Dr. Nicholas U. Mayall of the University of California discovered in observations from Lick Observatory, Mt. Hamilton, Calif. The calculation comes out the same, however: the sun is traveling in its orbit at from 175 to 185 miles per second.

FIVE YEARS TO BUILD

We are sending Carl Huber of Colfax, Wash., a $10.00 Workbench Award for this gasoline engine-powered tractor. It follows the original very faithfully, with a master clutch, two clutches for steering, Zerk grease fittings and leather-covered seat. It does about four miles per hour and weighs 205 pounds. An ambitious undertaking, very well executed. Let's see more.

Next Month

You're in bathing at the seashore, say. You see the triangular fin of a shark cutting through the water, coming straight at you. Do you have a chance to beat that shark to shore? How fast can a shark swim, anyway?

How fast did that last trout streak away with your fly? How fast goes the predatory muskellunge, tearing after its prey? How fast does a whale swim? What's the fastest fish so far clocked? How does man's mechanical creations, the submarine and torpedo, compare in underwater speed with the fish who live there?

Man, the incurable measurer, who determines so closely the speed of his athletes and his racing craft of land, sea and air, has gone down under the water and clocked the speed of the fish. As could be expected, there were surprises. All is covered in an unusual article in next month's MI—"Speed Kings of the Deep"—with photos and art in four colors. It's a "different" sort of article. You'll eat it up.

For you hobby-crafters there's a special Easter project illustrated in many color photos—an "Easter Egg Zoo." Chiefly, you use colored eggs, peanuts, soda-straws, bits of paper. It'll be fun. Easy, too.

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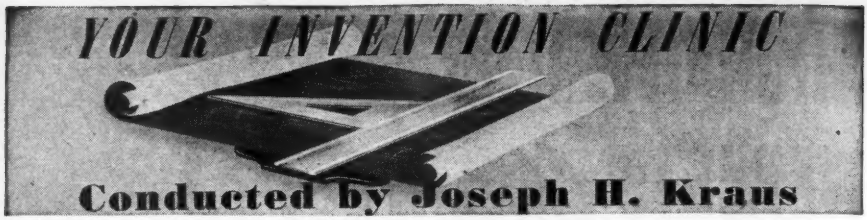

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed in inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Lawn Mower

Fred W. Gardner of Winter Park, Florida, asks about the practical side of a lawn mower on which a patent is pending.

ANSWER: *Assuming that a search has been made to indicate protection is possible and assuming also that you have built the item and have demonstrated that it works as you claim, then we think you should go right ahead with plans to market the item.*

We suggest, also that you provide each mower with an extra set of blades because we are inclined to think that these will be damaged easily if a hard object is hit. We also suggest you include some sort of flywheel to cause blades to continue to rotate even when cutter has reached the extreme end of its forward or reverse stroke. By the way, what happens on the reverse stroke anyway? On the present design the cutters would seem to run backward and with no effectiveness. A change here is recommended.

Folding Auto Steering Wheel

James Boyd of Benton Harbor, Michigan, inquires about a folding auto steering wheel.

ANSWER: *You have furnished no details, instead you have just given a generalized suggestion. Such controls are found in many different forms on the modern airplane. There is little to prevent use of similar designs on an auto. The safety feature is more imaginary than real.*

Trailer Dolly

F. W. Weeks of Mentor, Ohio, submits a design of a new method of attaching a trailer and its dolly to the rear bumper of the car.

ANSWER: *We can see no particular advantages, but if there are any you should be able to single them out by making cardboard models.*

It is surprising how many pitfalls may be ironed out and how much time and money could be saved by the inventor if he just took an hour or two with scissors, pastepot, thumbtacks, rubber bands and cardboard to make "working models" of his invention. In this case, for example, make a small cardboard model of an auto with only one front and one rear wheel also of cardboard.

Attach the wheels with thumbtacks to strips of cardboard. Rubber bands become springs. Now add a dolly and trailer made in a similar fashion. Place both flat on the table and add a cross-section of a rough road surface with a lot of bumps. This is just a strip of cardboard.

Push your "car" along the road and compare the action of the old style trailer with the suggested new design. We imagine the results will be rather hard on the bumper and tipping will not be prevented, in fact may become more commonplace.

Electrical Outlet Strip

Joseph S. Piepszak of Dorcester, Mass., states that he has applied for a patent on an outlet strip to which he "can attach five to ten different electrical appliances . . . without overload."

ANSWER: *To us this appears to be but a slight modification of a rather popular outlet strip which makes it possible to plug in a piece of electrical equipment anywhere in the laboratory or home. But this possibility has nothing to do with overloading the circuit. If the current consumption of the five to ten appliances is greater than the safety margin of the fuses and feeders you either will blow the fuses or dangerously overload your circuits.*

The outlet strip mentioned above does not require any special bent plugs. The standard modern plug fits it.

Perpetual Calendar

James G. Dollar of Vancouver, Washington, submits a design for a perpetual calendar for which a patent has been applied.

ANSWER: *Perhaps when the writer first started giving advice to inventors more than a quarter century ago, this idea might have impressed him. But it is so large and so expensive to manufacture by comparison with the "Automatic 50 Year Calendar" manufactured entirely of metal (Patent No. D-140,313) that little further consideration should be given to it unless super simplification would be possible.*

[*Continued on page* 22]

ADVICE
for the
INVENTOR

The United States Patent Office advises the inventor, unless he is familiar with such matters, to employ a competent, registered patent attorney since the value of a patent depends largely upon the skillful preparation of the specifications and claims set forth in his application.

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The Evidence of Invention form mentioned below is offered as a convenience to the inventor in making his disclosure of invention. The inventor should date and sign his disclosure and have it witnessed by two or more persons who are capable of understanding his invention. The disclosure should then be mailed together with the inventor's authorization to conduct a preliminary search at the U. S. Patent Office among previously granted U. S. Patents for similar types of invention. A report is then prepared on the probable patentability of his invention and a recommendation made as to the further course he should take in regard to his invention, provided that the patentability report indicates possible patentability.

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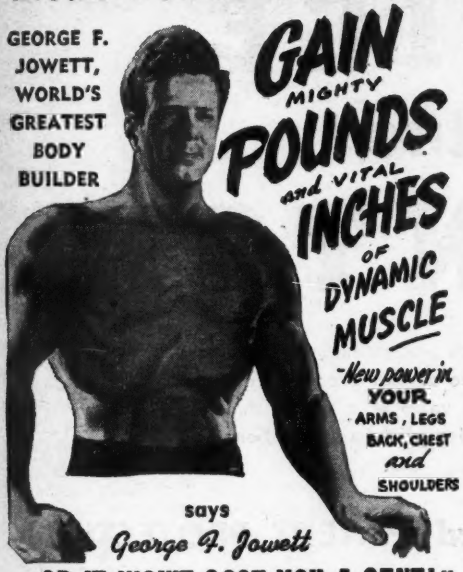

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NAME..... Age.....
(Please print plainly. Include Zone Number.)

ADDRESS.....

Your Invention Clinic

[Continued from page 20]

In our opinion you have entered upon a complication of assembly and manufacturing operations many of which could be eliminated to the benefit of the final end result.

Inasmuch as you are in this business, we would suggest that you first familiarize yourself with the many dozens of designs which have been marketed before, particularly the one mentioned above. It may suggest a new angle of approach.

Trailer Toilet

Mrs. T. F. Allen of Talbotton, Georgia, says that she has designed a toilet for trailers which is reported patentable. She wants to know what we think of the design.

ANSWER: *You certainly are working on the right track. There is a crying demand for satisfactory sanitation not only on trailers but also on small boats and perhaps even in touring cars. Many car passengers use wayside rest rooms with feelings of qualm and trepidation.*

But we are not convinced that you have furnished a satisfactory answer to the problem. You have just substituted a large outdoor slop-pail for the typical indoor type. With some modifications your design might be made infinitely "nicer" to handle, but then you run into a more serious disposal problem.

As your design now stands you eliminate a daily task and substitute a more difficult problem with which someone must wrestle less frequently. Offensive odors are not eliminated; on the contrary, would be present constantly.

We would recommend that you and others do a lot of thinking about this. A really good plan should net its inventor a sizeable fortune because of additional use on railroads and airplanes.

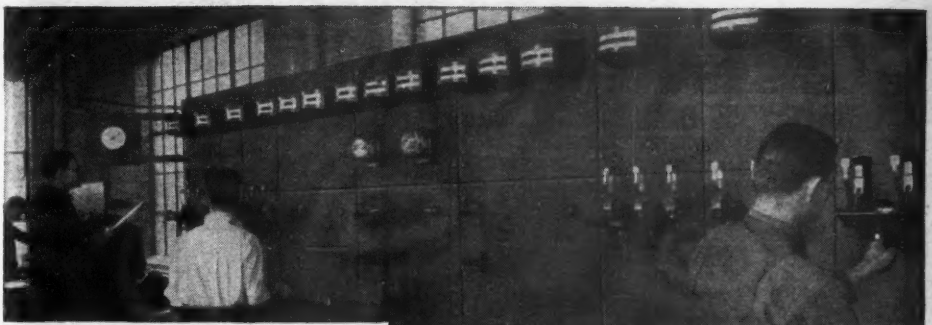
Bull Roarer

Stephen J. Zajac of Whiting, Indiana, states that while stationed at an air base in the jungles of Assam he obtained a toy made by a native which makes a sound like a locust. He then describes the construction of the toy. He wonders if there is any novelty here.

ANSWER: *One of the first novelties which my father made for me when I was but a child was a bull roarer. This was made from a piece of cardboard mailing tube, a diaphragm of parchment paper stretched across one end, a string through a hole in the middle and a wooden stick. As the item is whirled it makes a noise like a roaring bull. With smaller tubes the pitch of the sound is higher. A little powdered resin on the string at the stick end works wonders.*

We are doubtful that you can do anything with this unless you closely imitate the original and sell it as a "jingle" novelty.

[Continued on page 26]



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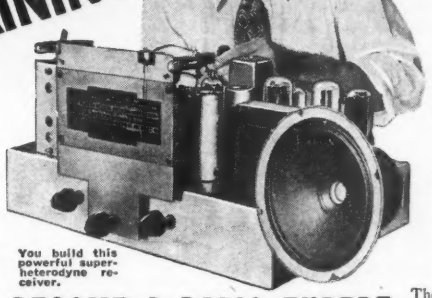

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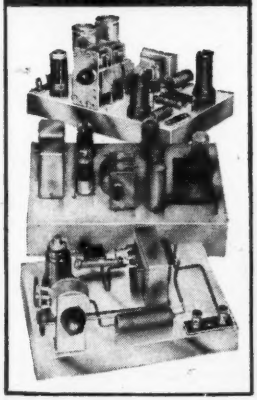

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[*Continued from page* 22]

Tubular Flashlight

Louise Aikman, West Terre Haute, Ind., wants to know about a tubular lamp which can be operated on flashlight batteries for use in a special reading lamp.

ANSWER: *Present knowledge does not permit of the construction of a practical bulb of this type. The reason is that if you want to get a satisfactory amount of light you will use up your cells too rapidly; perhaps you will have to replace the battery every ten minutes. This becomes rather expensive. It would be better to connect the light to a cable and supply current to it from the house circuit.*

But similar devices are on the market. In addition, there are bullet style spot lights which clamp to the headboard which will light the book only and not disturb the person alongside. Such lights are better because of even diffusion of illumination which is not possible with a clamp light.

Yes, there are concerns which will work up such ideas, but such designs are expensive, and in this case, not warranted.

Windshield Wiper

W. Sayer of New Westminster, B. C., Canada, says that he has designed a windshield wiper which will wipe clear across the windshield.

ANSWER: *Without further information about your device we cannot give encouragement to the scheme. Many buses and trucks throughout the country have wipers which do what you propose.*

Tatting Shuttle

Hilbert Daniello, of Allentown, Penn., submits a design for an improvement in tatting shuttles which he hopes will eliminate laborious hand winding.

ANSWER: *It is the writer's opinion that none of the plastic shuttles made today compare favorably with the older style of metal shuttles. You must remember, however, that the metal shuttles went out because of the war, but are making their appearance again. Some of these metal shuttles, because of the removable feature of the bobbin, can be rewound on sewing machines.*

Although we believe that your improvement would be helpful insofar as the plastic shuttle is concerned it still leaves much to be desired. We would recommend that you give this design much further thought. There are a half dozen ways in which rewinding can be expedited. A really good item might be a shuttle which would rewind itself or you could make a high speed rewind by a mechanism somewhat similar to the one you suggested. But don't try to apply only to the plastic shuttles. Think also of the metal items.

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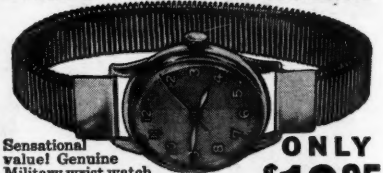

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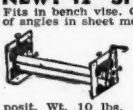

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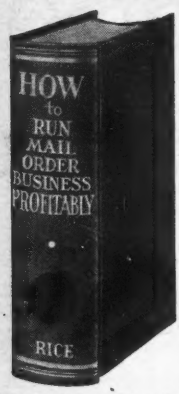

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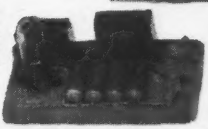

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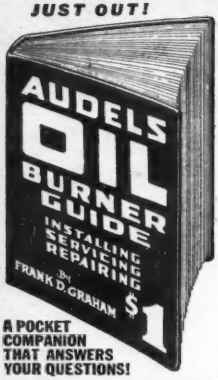

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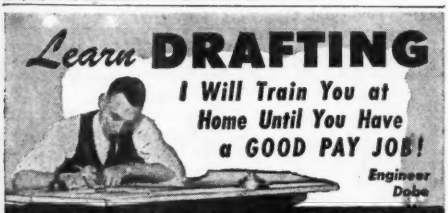

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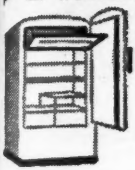

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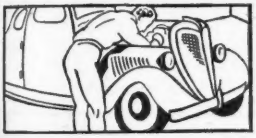

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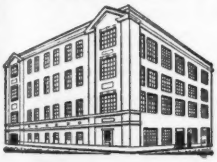

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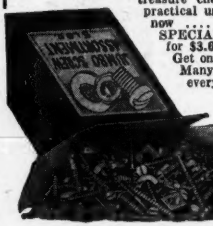

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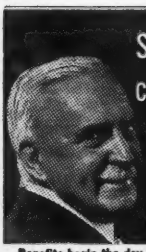

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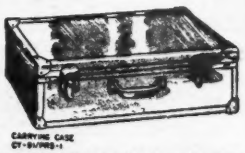

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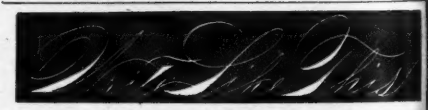

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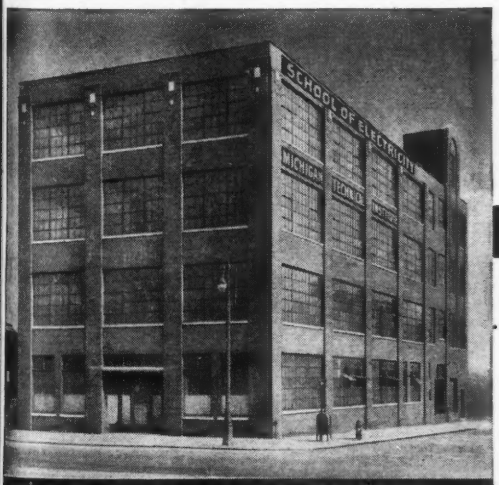

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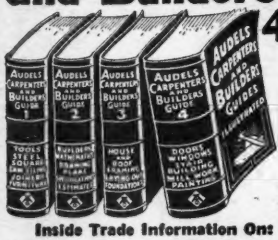

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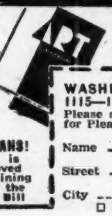

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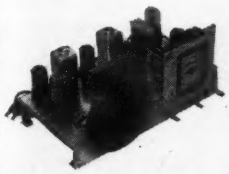

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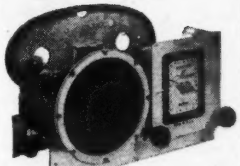

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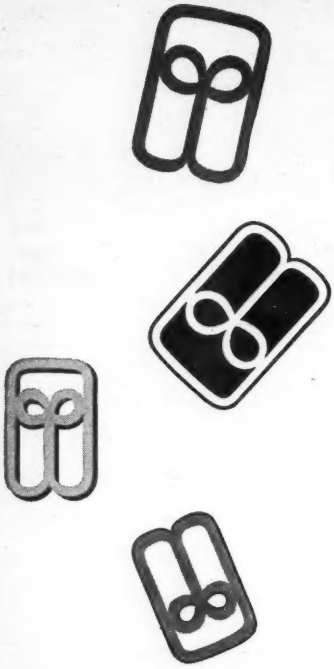

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Criminals who duel with the FBI buck an ultra-modern crime lab served by tough men competent in 88 sciences.

newest tricks of the G-men

BY J. EDGAR HOOVER, as told to James Nevin Miller

SOME months ago thieves broke into an Ohio metal-working concern and stole a number of valuable copper ingots. The local sheriff's office found a pair of gloves at the home of a suspect. A preliminary study indicated the gloves were impregnated with what appeared to be copper filings which might have been wiped from the surface of an ingot.

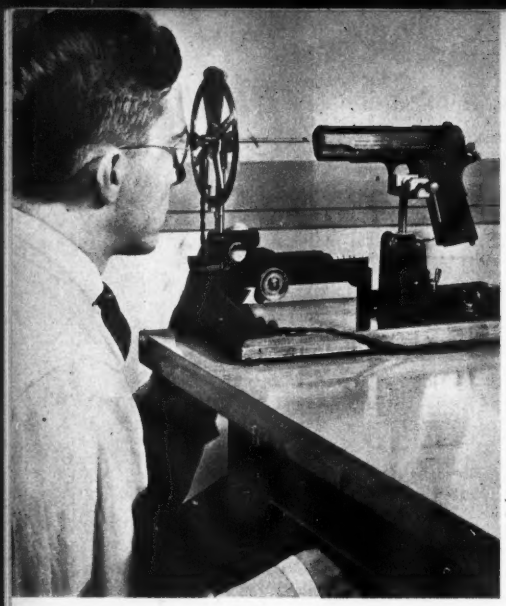
These specimens were sent to the FBI Laboratory in Washington, with a request to determine whether the copper particles found on the gloves were the same as the metal in the stolen ingots. A microscopic study revealed the presence of copper particles on all the fingers, and on the palms, of the gloves.

Next the particles were examined in the spectrograph, one of our crime-fighting instruments which performs near-miracles in the study of metallic composition. This proved that the bits of copper were similar in composition to the metal in the stolen ingots. The jury found the suspect guilty and he was imprisoned.

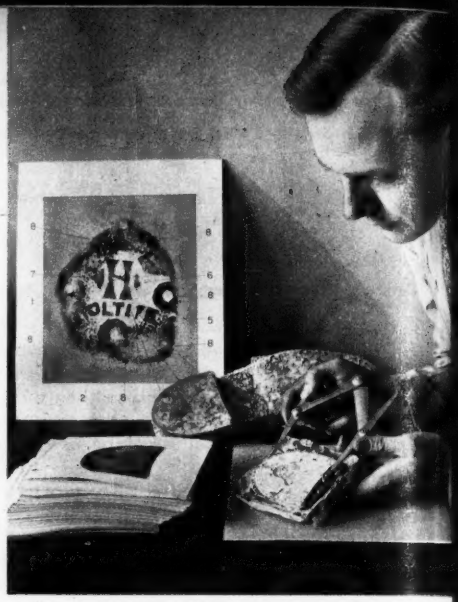
The spectrograph is an outstanding scientific weapon, but our technical laboratory in Washington uses many others. Today, common salt and samples of soil are being used to solve crimes; there are revolutionary uses for ultra-violet and infra-red photography; and we have an instrument in which a substance no bigger than an ordinary pin-head is sometimes sufficient to solve a murder mystery.

Our laboratory is capable of analyzing evidence with the aid of 88 sciences and

Testing the use of tracer bullets to surround and "smoke out" criminals. Left, John Edgar Hoover, who started his ultra-modern crime laboratory in 1932 with one man and one microscope.



One of the major crime-solvers is the helixometer, used in studying the interior of weapons.



Technician examines plaster cast of heel print. Photo comparisons have tripped many a criminal.

sub-sciences. Even a hasty glance at our present-day devices and methods would make it difficult to believe that this ultra-modern laboratory started out in 1932 with one man and a single microscope!

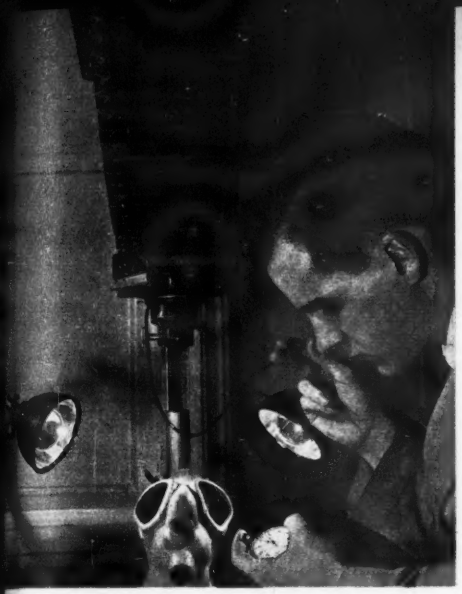
In a recent 12-month period the laboratory conducted more than 67,000 examinations. During this time some 100,000 specimens were studied. The other day when I was describing the laboratory to a young friend I called it a service organization. He smiled and said, "The guys at school like to think of it as All-American."

This youngster made a statement that is literally true. Since the laboratory's humble beginning only 15 years ago, we have made its ever-growing facilities available not only to all other Federal agencies, but also to all the nation's duly constituted law enforcement bodies in order to supplement and strengthen their vital work of criminal investigation.

It is surprising to find that a substance as common as ordinary table salt has an indispensable place in the FBI Laboratory. It is used constantly in biochemical examinations conducted with reference to evidence submitted to the Laboratory. For example, it is often necessary to remove dried blood stains from clothing or murder weapons. A diluted salt solution is used to remove these blood stains. An unusual apparatus is in use for analyzing the presence and amount of a certain gas in the human blood, for example, carbon monoxide.

One of our oddest-looking instruments is the metallograph, a microscope which uses vertical illumination to furnish the light by which the specimen is examined. In the conventional medical type microscopes, the sample is illuminated by light passing from the lower portion of the instrument up through the specimen and into the eyepiece. Since metal is opaque, obviously this system of lighting cannot be used. For the technician of today, science has designed the metallograph in which light is directed straight onto the specimen from the inside of the miscroscope tube. A study of the metal grain structures by the metallographer reveals many important criteria which we use in conducting our metal examinations, such as heat treatment, grain size, identification and distribution of inclusions, and identification of micro-constituents.

As I mentioned earlier, the spectrograph in one of our finest crime-solving instruments. In this piece of equipment a specimen is burned. The light emitted



Tool marks frequently leave telltale evidence, and this photographic apparatus helps reveal it.

A minute particle burned in the spectrograph is enough to reveal all its essential components.

is broken up into its component wave lengths, which are then photographed. The resulting photographic plate permits the laboratory technician to identify with great precision the individual elements in the burned specimen.

Extreme sensitiveness is the highlight of the spectrographic method. It permits the detection, and an estimation of the amount, of elements present in such minute quantities that they would be inappreciable if sought by the more conventional methods. Even a sample the size of a pinhead will often be sufficient for a thorough spectrographic analysis. Another advantage of the method is its remarkable speed. Two paint samples involved in a recent hit-and-run case were analyzed and the answer wired to the sender within two hours of receipt of the evidence. In some cases it is possible to verify within 15 minutes the presence or absence of a particular element, thanks to this truly marvelous device.

Another promising newcomer in the field of scientific crime detection—and incidentally, a scientific relative of the spectrograph—is the X-ray spectrometer. It is excellent in identifying crystalline substances. The method involves the reflection of X-rays off the specimen. The location and intensity of the deflected X-rays are detected by the use of a Geiger-Mueller counter, the same type of device used at Bikini and elsewhere to determine the presence of radiation caused by atomic bombs and other radioactive material. The counter is so sensitive that it will measure the radiations from a luminous dial on a wrist watch.

More and more emphasis today is being placed on soil and minerals as an aid in solving crimes of extreme violence. In this connection we have a valuable aid in the petrographic microscope, now in constant use for analyzing soil specimens. For an example of its use:

Some time ago the police chief of Rocky Mount, N. C., took to FBI officials in Washington a number of exhibits secured in a study by his office of a puzzling assault case.

During the local investigation several articles of clothing were found in the accused's home. These were among the exhibits brought to the FBI Laboratory for study. Our examinations disclosed the presence of human blood on a shirt, a pair of trousers and a sweater. The Laboratory technicians also found human blood on a piece of wood which had been used as a club. It is noteworthy that the blood found on the

trousers was chicken blood. However, the FBI tests proved conclusively that besides chicken blood, human blood also was present.

A hair removed from the club was found to correspond to head hair of the victim. Soil specimens were removed from the hat, trousers and shoes which had been taken from the suspect's home. These were compared, with the aid of the petrographic microscope, with soil specimens taken at the scene of the crime and were found to be similar in appearance and microscopically alike in all respects.

During the trial the results of the FBI Laboratory examinations were made available to the court. The Rocky Mount police chief said that with these results the State was able to present its case very effectively. The defendant was found guilty.

More and more in recent months our Laboratory technicians have been stressing hair and fiber evidence as an aid in solving puzzling crimes. A big reason for their outstanding success in this type of work is the use of the comparison microscope. It makes possible the comparison, under high magnification, of questioned and known hair and fiber specimens. This means that the specialists are able to utilize to conclusive advantage, evidence which requires detailed analysis of clues which at first glance might seem sketchy and inconclusive.

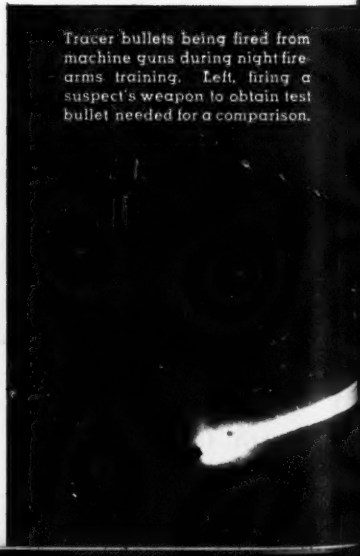
Time and again the Laboratory researchers have been able to assist in the identification of criminals by means of hair and fiber evidence. This is now possible largely because the comparison microscope reveals such characteristics as color, scale structure, diameter and distribution of pigmentation.

One of our most valuable tools is infra-red photography. By it, surface alterations invisible to the naked eye may be revealed. Certain inks are practically transparent to the infra-red rays, whereas other inks are opaque, thus making it possible to photograph through the one ink and not the other. Even invisible residue traces of certain types of inks below the surface of the paper or other material, oftentimes can be disclosed in clear-cut detail by infra-red photography.

Take the case of a leather money bag found on the person of a notorious safe-blower who was captured in an Eastern city by FBI Agents. He was under suspicion not only of stealing a car but also of being active in recent bank robberies. Also among the man's possessions were found sticks of dynamite, numerous weapons and a supply of nitroglycerin.

Visual examination of the money bag disclosed no identifying data which would aid in tracing it. However, a few minutes of infra-red photography on the part of FBI Laboratory technicians clearly disclosed the name of a New Jersey bank from which it was stolen. As a result, not only was the car theft solved, but also a puzzling bank robbery that had occurred some weeks earlier.

Another effective "light" weapon we



Tracer bullets being fired from machine guns during night fire arms training. Left, firing a suspect's weapon to obtain test bullet needed for a comparison.

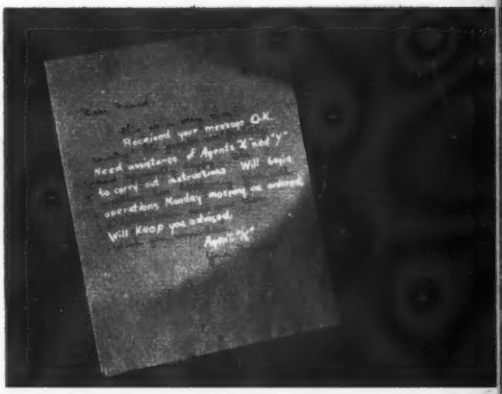
use in our scientific crime detection is the ultra-violet lamp, used to identify certain substances which have a characteristic fluorescence. For example, certain quinine salts have a bright bluish fluorescence. The chemicals used to erase writing from documents often cause a difference in the fluorescence of the document and this can be detected when placed under the ultra-violet lamp. Small smears of greasy material found on suspect's clothing can be seen very readily under the lamp.

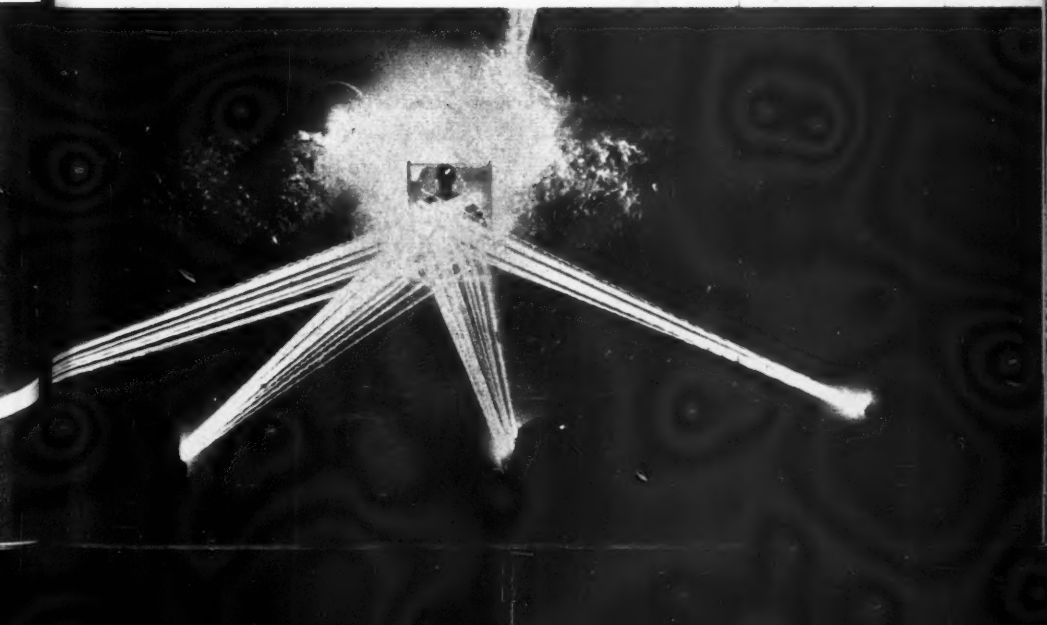
Many biological specimens fluoresce strongly under the u-v lamp. Examples are bones, teeth and urine. Obviously such a characteristic is of great value in the examination of evidence concerning crimes against the person. In cases of criminal assault, for instance, the lamp often is of aid in locating stains on articles connected with the offense. It is of course difficult to detect minor stains on blankets, sheets or underclothing with the naked eye. Under the ultra-violet rays the smears glow.

Natural teeth have a brilliant whitish glow when illuminated with u-v, whereas artificial teeth have a dull purplish or reddish appearance.

Thanks to ultra-violet detection procedures, one of the biggest bank robbery cases in history was solved by the FBI. The only clue was an employee's identification badge. The badge had been doctored up, but u-v revealed the name of the man to whom it had originally been issued, and that man was tracked down and found guilty.

Above, moulage casts of three fingers and a thumb. A combination of art and science is required for the obtaining of such realism. Below, an example of secret writing revealed by ultra-violet light.





Rockets may soon be used even for short throws like this. Here a Coast Guardsman hurls a line with a friendly shot.

Rockets to Rescue

With lives at stake, 400-ft.-per-second rockets throw life lines to the rescue.

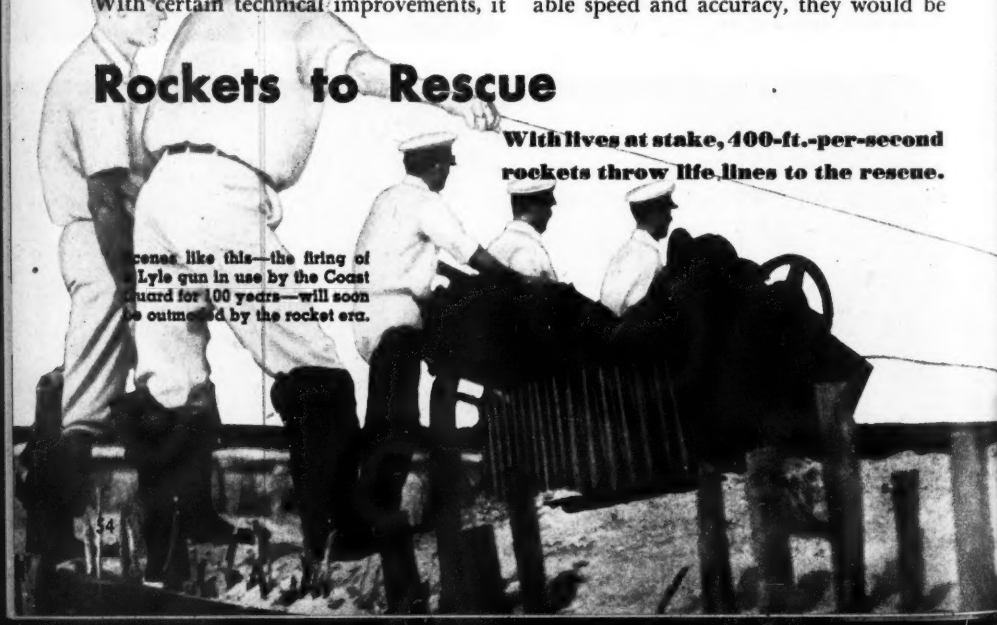
BY COMMANDER R. D. SCHMIDTMAN, Acting Chief, U. S. Coast Guard's Testing and Development Division.

THE rocket principle, which proved its tremendous power and accuracy in wartime in the bazooka, the hedgehog and other death-dealing weapons, now shows great peacetime promise for saving lives at sea.

For well over a year the Coast Guard's Testing and Development Division has been blue-printing the idea of adapting rocket power to the propelling of a lifeline to a vessel in distress, without requiring additional lines to serve as "messengers" for hauling in vitally needed equipment. It was my privilege to test this novel idea at Fort Belvoir, Va. With certain technical improvements, it shows great promise as an effective tool.

What we've been seeking first of all is lighter, safer and more efficient equipment than that in use today. For almost one hundred years the Coast Guard has been using a Lyle gun to throw out its rescue lines. This is a small brass cannon weighing about 250 lbs., using about 6 ounces of powder and a 16-pound projectile. Its maximum throwing distance is 1200 to 1500 feet.

In the Belvoir tests seven rockets were fired with seven different types of lines. We figured that if the lines reached their targets, some 1050 feet away, with reasonable speed and accuracy, they would be



Scenes like this—the firing of a Lyle gun in use by the Coast Guard for 100 years—will soon be outmoded by the rocket era.

doing a bangup job. Actually some of the rockets exceeded this distance and in some cases the projectiles straddled the target within eight seconds of their take-off.

We used several types of rockets, among them a 400-foot-per-second rocket. It's a Navy standard rocket of the type used during the war and officially designated as a 3.25 missile. Its entire equipment weighs about 48 pounds.

A surprisingly satisfactory degree of accuracy is indicated by the flight of the rockets tested this far. As an indication of the power and efficiency of the method, a heavy three-circumference line, the use of which would not be practicable with most throwing devices, was carried a distance of 600 feet by one rocket, clearing a 50 foot high target, en route.

The new method of throwing lifelines, if it fulfills its early promise, will be valuable not only to the Coast Guard and other leading life saving agencies, but also to the entire Maritime industry. While the precise results of our tests with the new equipment have not yet been analyzed, certain facts about it are obvious enough. Before the rocket method reaches the practical stage it requires lighter equipment, more accuracy in aiming, and rockets that will land in a cool state with all ash expended from the rocket chamber. This last consideration is of special importance since hot ash would be a serious hazard at sea in the event of the large-scale presence of oil or other inflammable hazards strewn about the water in the vicinity of a sinking vessel. But the rocket era is at hand.

Right: Cmdr. Schmidtman, author of this article, readies a 3.25-inch missile. Above: It's off, at 400-ft.-per-sec. Equipment weighs only 48 pounds.

Left, new high-pressure nozzles 20 seconds after ignition. There's no smoke! Below, a "hole" the length of the runway made in solid fog in six minutes.

The Fogfighters

Tightening castings in the effective Hades-Rapex burner, which utilizes 16 vaporizing tubes and achieves an extraordinary thermal output

They're burning it, blowing it, blasting it with sickening sound. A great experimental war is being waged on the enemy Fog.

A remarkable action picture of a fog-dispersal system at the instant of ignition. The smoke soon disappears.

UNCLE SAM has declared war on fog. For the next five years, one million dollars a year will be spent by the Army, Navy and CAA in a great combined operation to lick this greatest of flying hazards.

The laboratory battlefield has been set up in an ideal spot—a former Naval air station at Arcata, Calif., along the Oregon border—a place on a steep hill near the ocean in the foggiest section of the United States.

Every major type of fog-dispersal technique known is now being set up, among them two revolutionary newcomers, a method of atomizing fuel by high pressure rather than heat, and a sonic method whereby fog is changed to rain by high-frequency sound-wave bombardment.

Fog dispersal is needed and it will continue to be needed. Present instrument landing techniques will bring a blind plane safely down to within 50 feet of the ground, but from then on the pilot wants to see what he's doing. Even when fully automatic instrument landings becomes possible, the physical and psychological benefits of having the pilot able to see, will still make

The sonic fog-dispersal method uses a set of 12 sirens spaced 100 feet apart along the approach. Below, closeup of a siren being operated by Comm. R. L. Champion, notable pioneer in fog dispersal.

a certain amount of fog clearance necessary. A ceiling of 200 feet could do the job.

The new high-pressure dispersal system is basically a pipe-line with nozzles set up at regular intervals of about 15 feet. The fuel flows through the pipeline and is forced up through the nozzles in the form of finely atomized spray which is ignited electrically by a unit known as a calrod. Gasoline, kerosene or diesel oil can be used. There is no smoke and no waste.

In the sonic method, sound waves produced by great sirens are made to bounce the fog particles around, causing them to meet and merge, thus forming units large enough for precipitation as raindrops.

A major obstacle is the effect of the sirens on men who are close. In early tests personnel kept cotton covered with sponge rubber in their ears, and they reported no ear trouble—but most of them became nauseated from the terrific noise. The noise blasted birds from the sky!

One possible way around this obstacle may lie in the use of ultra-sonic transmitters which send waves out at such high frequencies that men and animals can't hear them. These will be tried out.

Navy officers believe the high-frequency sound system if successful will be more practical than thermal means. Installations would cost no more and operation would be more economical. A portable apparatus would greatly aid plane landings on carriers operating in fog.

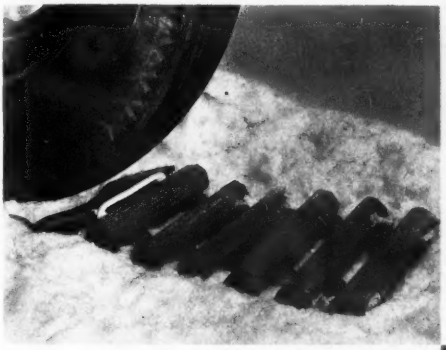
Test will also be made of the effects of the sound on airmen, and even of possible damage to the aircraft in which they fly.

A third approach to the problem is the novel, promising, wind-curtain method. By it, a huge blower throws a curtain of hot air at right angles to the wind. This causes the wind to move in a vertical circle, dispersing the fog.

The present two best "bets" look like the high-pressure and sonic methods—but everything known will be both tried and improved, if possible. The war against fog is on, and Uncle Sam doesn't lose his wars.

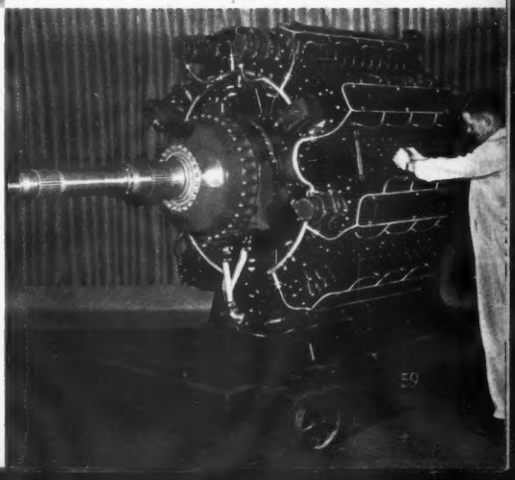
Steel Shell which forms the top on this midget racer came in handy when the car made two complete rolls on the Motor City Speedway in Detroit recently. It suffered only minor paint damage and the driver, "Doc" Shanebrook, veteran speedster shown here, was unhurt. He says he got the idea for the shell while in a New Guinea hospital.

Handy Handle on this Tenite fishing reel does the work of four separate controls. Turned clockwise, it winds the reel. With a slow movement clockwise, it's a brake. On "click" the handle acts as a lock, and on "free spool" you can cast.



Auto Snowshoe, above, provides traction for rear wheels when you get stuck in the snow, ice or mud. All you do is toss it in front of or behind the wheel that's bogged down. It costs only $1.98.

World's Most Powerful reciprocating engine, the 5,000-hp Lycoming X-7755, is shown at right. It has 36 cylinders arranged in four banks of nine each. When operating at maximum power, it burns 580 gallons per hour.



BY LOUIS BRUCHISS

DESPITE vehement reiterations that the atomic bomb is the absolute weapon, a conviction has been growing that Einstein's original equation $E = MC^2$ has not had its final say.

The very paucity of our knowledge of the complex nuclear reactions and of the origin of matter and energy itself, would at once suggest that there may be a weapon more encompassing and deadly than the atomic bomb.

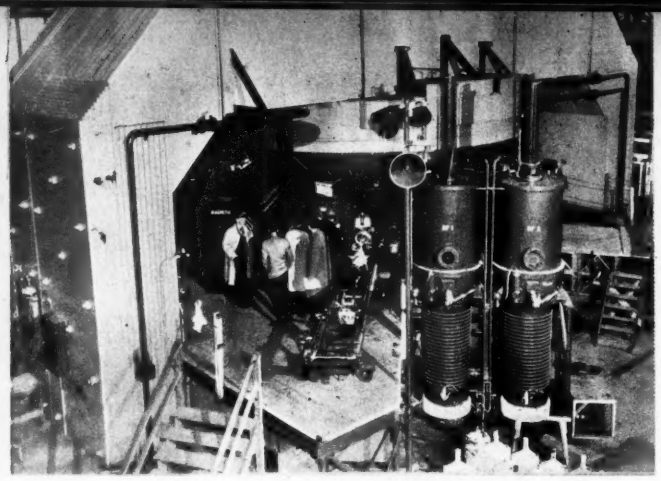
Such a weapon could well be the cosmic ray gun.

The possibility was hinted at recently by European cosmic ray scientists. The prospect is enthralling and frightening. The cosmic ray-gun would be the first weapon ever to use trigger energy out of this world.

Cosmic rays have been the subject of deep research

COSMIC RAY-GUN

Atoms exploded by cosmic rays release far more radiation than is obtained by ordinary fission. Here's a potential death-ray!



Physicists and guests have a look at Berkeley's giant new 4,000-ton cyclotron which produces atomic bullets with energies of 200 million electron volts.

by investigators for the past two decades.

What are cosmic rays?

They are powerful particles of energy, originating as individual elements similar to light photons and electrons, which are shot like bullets from the vast unknown regions of interstellar space to all parts of the earth, day and night.

After entering the atmosphere at tremendous velocities, the streams of cosmic ray particles collide with the nuclei of atoms of air, bursting them apart and imparting to the particles so formed even higher velocities than the original particle had.

The particles produced through such cosmic ray-atmosphere collision are about 200 times the mass of an electron and are known as mesons.

Each minute every human being on earth is being hit and penetrated by thousands of these mesons. The individual one has measurable energies up to as much as two billion electron volts. Since the gamma rays of an atomic bomb explosion are only two million electron volts, cosmic ray energy may therefore be a thousand times greater than any produced so far on earth.

Fortunately the density and duration of life of the rays is low, far below the point where they can do harm to human beings.

But how would one go about constructing a lethal cosmic ray-gun using these mesons?

A beginning has already been made in the United States. University of California scientists, leaders in building cyclotrons and other atom smashers, have constructed an experimental "linear accelerator"—an atom cannon that hurls a stream of protons, the nuclei of hydrogen atoms, in a straight line instead of in the spiral orbits of the lesser energy particles of the cyclotron. This means that the apparatus will energize the atomic projectiles toward the billion electron volt mark and places them in the class of cosmic rays.

The unit is only 40 feet long and is flanked by batteries of obsolete radar sets, 15 of which are installed at equidistant spaces along the outer copper tube of the accelerator. Inside the tube is a sectioned, rifle-like barrel through which the protons are shot. As they pass each section of the inner tube they are accelerated or given a "push" by the respective high-frequency radar outfits, to finally emerge at about 40,000,000 electron volts at the muzzle.

After this initial model has been fully tested, a larger pilot model, 280 feet long, with seven 40-foot sections, will be built. To reach cosmic ray intensity it is estimated that an apparatus 1,000 feet long would be required.

Obviously this length would be impractical in modern warfare, but it is not unreasonable to suppose that still more powerful electronic energizers can be made to impart still more billions of electron volts of energy to the protons, all within the confines of gun barrels of usual length.

Once this is accomplished, we will have a usable cosmic ray-gun, the first real death ray. Such a gun could be mounted in heavy bombing planes, in

B-29 cosmic ray laboratory, used in flights from Canada to Peru.

controlled or satellite rockets, or on any high vantage point, and aimed at the enemy day and night. It will emit no sound and no light; and no other evidence that it is functioning will be noticeable except the clicking of radiation counters that may be put in the path of the invisible stream.

The only protection against the cosmic gun will be extremely heavy shielding. Underground shelters are again indicated. Above-ground buildings will have to be guarded with lead or other barriers. Against one type of ray —rare, fortunately—it has been estimated that a thickness of as much as 75 feet of lead would be required! This particular ray has 10,000,000 times the radiation energy of the atomic bomb, according to calculations of scientists from the Barthol Foundation of the Franklin Institute.

Depending upon the energies used, individual armored suits of high-density material might be feasible.

Unlike present guns which shoot projectiles strongly subject to gravity and of limited range, the cosmic ray-gun will project a death-beam able to travel in a nearly straight line for thousands of miles. If aimed at or near sea level, they will fly straight off into space, except as they are deflected by the earth's magnetic field or are absorbed by the earth's atmosphere.

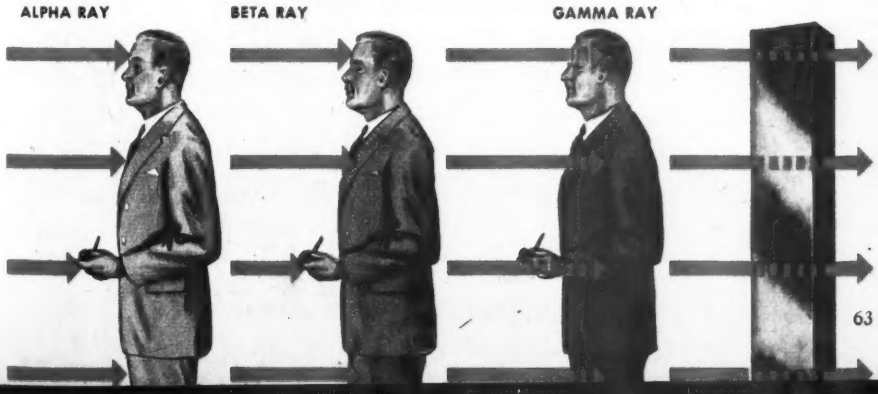
Because the atmosphere itself is the medium in which the mesons are created, the new gun will generate a new type of fission, producing, not the heat, blast and noise of an atomic bomb, but silent death-dealing radiation which would be extremely hard to evade.

Under radar-like sweeps from a mountain top or from guided missiles, animal and plant life would wither away.

The stream [*Continued on page* 162]

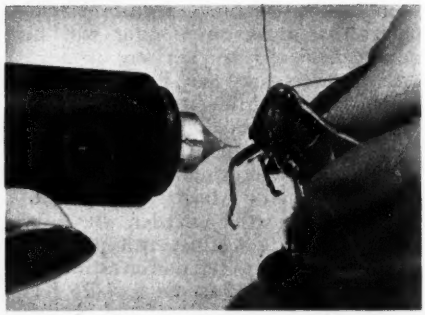
Relative penetration of A-bomb radiation. Alpha ray burns skin but is stopped by clothing; beta ray reaches blood vessels; gamma ray penetrates man and nine inches of steel.

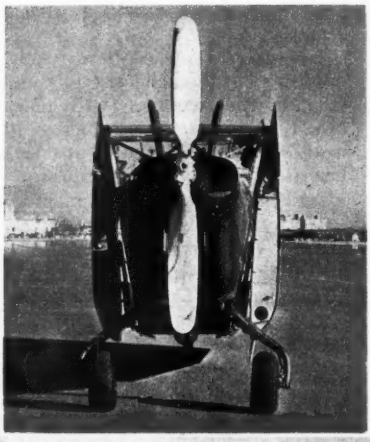
RADIOACTIVE PENETRATION



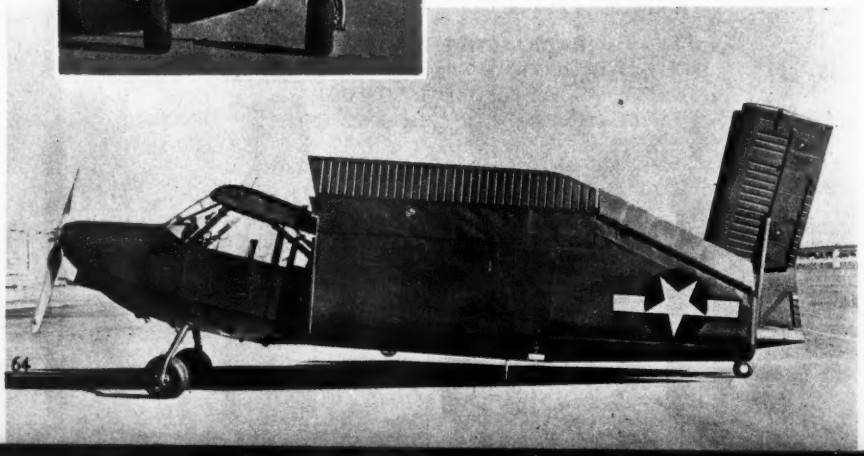
Movie screen in the parlor need no longer be a problem with this new device known as the Pict-O-Screen. Concealed within the frame of a lithograph print, it can be pulled into place with a cord whenever your projector is ready. When the show is over, just tug the cord again and the screen disappears. It's made by Radiant Mfg. Co., Chicago.

Feverish'hopper in the picture at your right has his temperature taken at varying body temperatures with the world's smallest thermometer (dia. .005 in.). He died when his fever reached 120.





Folded Wings of the Consolidated Vultee L-13 are handy for highway towing. With wings and flaps extended, the 245-hp liaison plane can take off in 230 feet. It's cruising speed is 92 mph, but it can be towed in the air at 150 mph.



MOST "mountains" in the United States are merely big bumps. They may be climbed by anyone with sufficient stamina to keep putting one foot in front of the other in the thin air of high altitudes.

Providing you have a guide who will show you the easy way up, the only mechanical aids needed for this kind of climbing are shoes that will not slip, and whatever camping equipment the inaccessibility of the mountain demands.

There are plenty of tough climbs for the mountaineer who has graduated from the tourist stage, however, and these require certain mechanical aids, all of them simple.

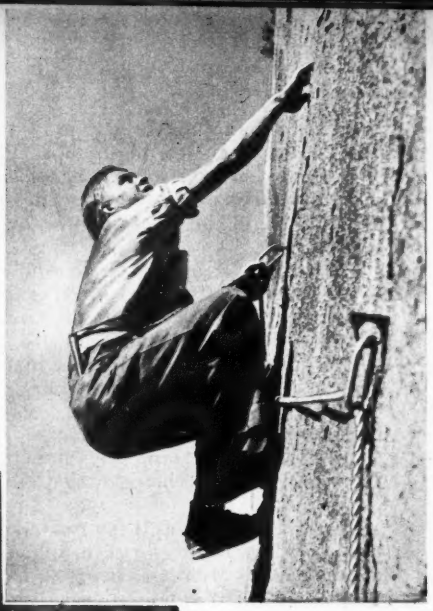
The most useful aid is the rope. Four-strand Italian hemp, $\frac{1}{16}$ in. in diameter, is preferred to Manila as being easier on the hands, but it is no stronger. Woven

Left, method of using hands in roppelling. Below, lower man finishes climb up rope belayed by upper man—who himself is tied to a rock for security.

Going up!

BY BOB GORDON

If you've ever wondered how the mountain climbers get up those vertical cliff faces—here's how.



Rope tension climbing. Left, use of pitons and snap rings. Right, leaning out against rope while driving in next piton.

and linen ropes are also easy to handle, but cost considerably more. The usual length is 80 feet for two climbers, 120 feet for three or four. On difficult rock faces, longer lengths are often useful. An extra shorter length is sometimes carried to haul up packs. Double rope tension work requires two climbing ropes.

The elasticity of a rope is its safety factor; therefore an old or frayed rope, one that has withstood the shock of breaking a fall, or has been used to support a man's weight a considerable time, should be replaced. A climber's rope should never be wetted and stretched to make for easier handling, as this removes the elasticity.

Ordinarily the rope is not used for climbing or hauling up a person. Its support is largely moral. The knowledge that a simple slip will not mean a fatal fall adds tremendously to confidence. The party should be roped up as soon as any member feels a sense of danger, and the guide or leader is responsible that this is done soon enough. The rope should always be used in crossing a glacier, an ice slope, or a steep snow slope.

The end men in the rope place themselves in the loops of bowlines tied high on the chest. Other persons secure themselves to the line with an overhand noose or butterfly knot. Many experienced climbers secure the rope at the waist to permit greater freedom of the arms; but the waist is not

This chap's doing the "impossible"—climbing a vertical face. He's using expansion bolts. Placing them is exhausting work.

protected by a bony structure, hence the sudden stopping of a fall by a loop around the waist is likely to cause serious injury.

When the party is walking, each person except the lead man carries several coiled loops of the rope in his hand, paying it out or taking it in as necessary to prevent jerking or dragging. A closed loop prevents a chafed or broken hand in case the man ahead falls.

In negotiating a difficult passage, one member of the roped party proceeds at a time, while the others belay in order to check a fall.

Rock belays may be used to help a climber coming up from below, where the fall would be a matter of inches only. Where the climber is above, rock

Above right, the rope is seen passing through three pitons, and the climber leans from a fourth, concealed by his leg.

Rope used in rappelling holds a man by friction alone, freeing hands. No, it's not dangerous.

belays are dangerous, as they do not offer the "give" of the human body. While a good climbing rope will support a ton, it can be snapped by the too sudden checking of a 12-foot fall by an average man. When there is danger of the belaying person being carried away by the fall of another, he should tie himself to the rock by a loop over a projection or by means of a piton, and then use a shoulder belay to protect the climber.

The use of the rope, together with pitons and snap rings, makes it possible to climb any rock wall, no matter how steep, providing only that cracks may be found for the pitons.

Pitons are spikes, made with shanks of varying shapes to fit the various types of cracks encountered. The best ones are made of charcoal iron, which deforms easily when being driven to fill the crack. A ring near its base is an integral part of the piton, although for roping down a piton a loose ring is better. [*Continued on page* 164]

Thar she blows!

BY TOM McCAHILL

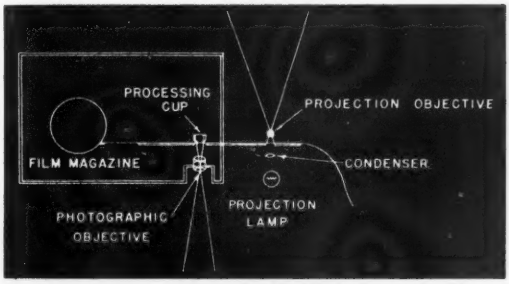
BLOWOUTS at best are very unpleasant, but when engineers sit down and work out methods to cause them it doesn't necessarily mean the engineers have holes in their heads. Every time wheel or rim specifications are changed, the reaction of parts involved becomes a critical factor. Few automobile owners realize the safety tests every new model car undergoes. Slip-ups could mean ruination to manufacturers. As an example, assume that car X, through an oversight, is being delivered with wheels that collapse under the shock of a blowout. Rumors would quickly spread from coast to coast that car X was a killer, sighting this or that incident, and it would take an extremely powerful manufacturer to weather sales resistance that would soon build up due to this one weak point. Ford has created the sure-fire method, shown here, of simulating blowouts by actually blowing up the tires with dynamite caps while the car is under way.

Top: She's just blown at 40 mph and is losing air fast. Above: Hub slip ring permits contact to explosives.

Left: Just before the test—three dynamite caps have been carefully inserted into the truck tire casing.

Photography Gets HOT

Pictures are snapped, processed and projected—all within 15 seconds with the machine above.



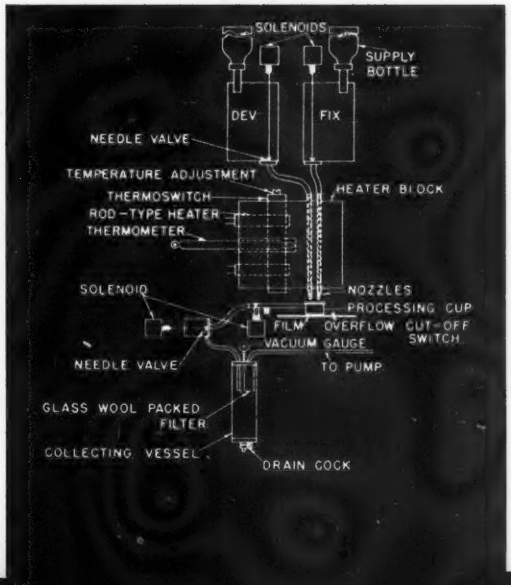
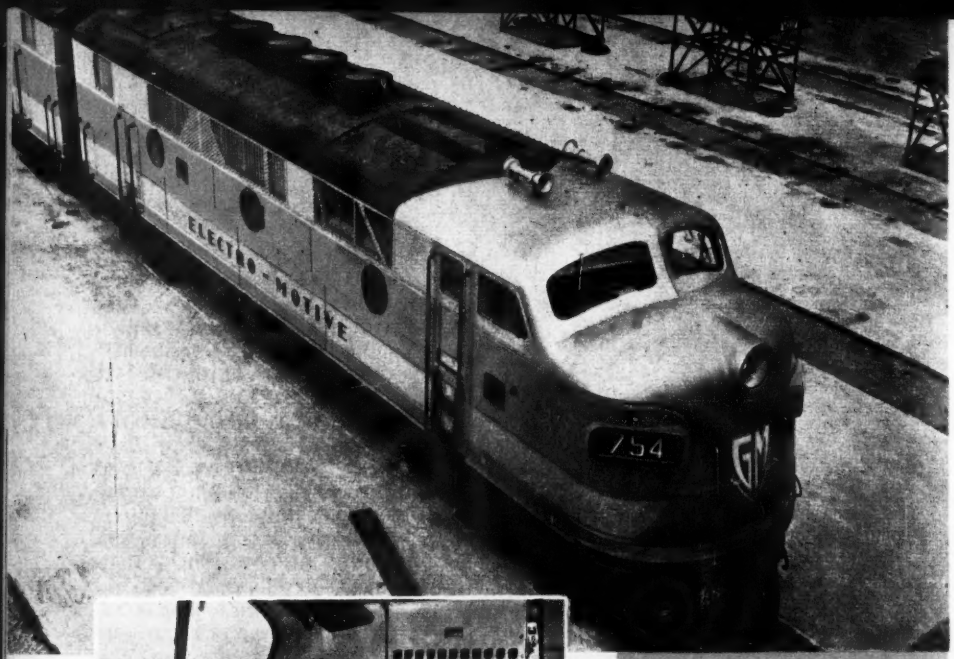


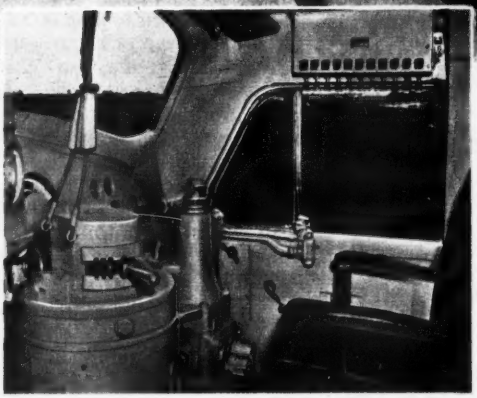
PHOTO processing has shifted into high gear with a machine that snaps a subject, then processes the film and projects a finished screen image—all in 15 seconds.

The heart of the versatile machine, developed by Eastman, is a processing cup, through which 16-mm. direct positive film is pulled intermittently by an automatic timing mechanism. High-energy developer and fixing solutions, heated to a temperature of 140 degrees F., are successively squirted on to the emulsion surface of the exposed film, which forms the bottom of the processing cup. The solution is removed from the film surface in each case by means of a vacuum applied to a suction line; continued suction after a final rinse serves as an effective dryer. About nine seconds in all are required for the action of the developer, fixing and rinse baths.

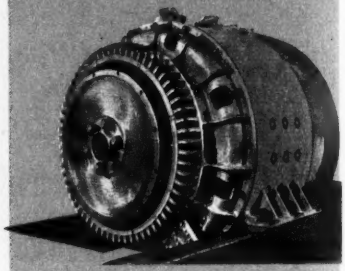
The developer used is a modification of Kodak D-82, with about twice the normal quantity of caustic soda and a humidifying agent, ethylene glycol, added. Two parts stock developer and one part water are used in the working solution. The extra caustic speeds up the active D-82 still further while the humidifier (10 per cent of the volume of the working solution) permits the developer to "double" as a rinse bath after fixing, without crystallizing out on the dried but unwashed film.

The fixing bath used in the automatic machine consists of 1 part Kodak liquid X-ray fixer and replenisher (without hardener) and 2 parts water.

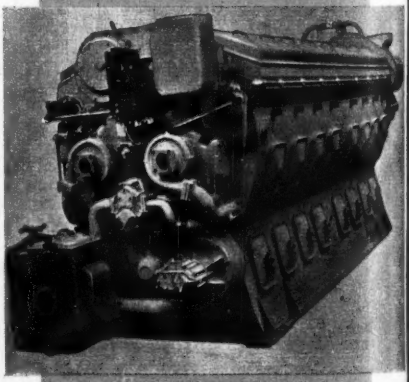




Cab interior features space, comfort, visibility. Note window wipers and air horns.



Generator produces DC for train propulsion, also AC for operation of accessories. Below, the 16-cylinder diesel engine.



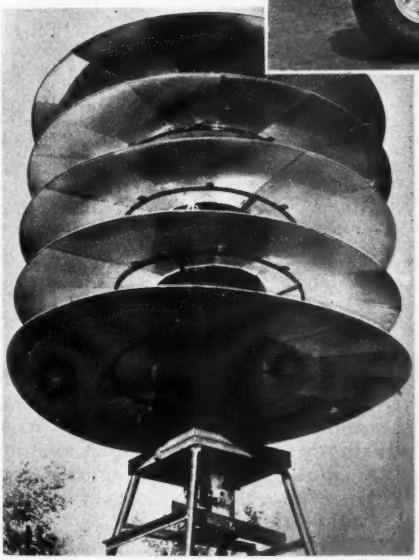
ALL-PURPOSE LOCOMOTIVE

A NEW diesel-electric locomotive of great flexibility, the F-3, has been put into production by General Motors (see picture on front cover).

Each of its four units gives 1500 hp on the rails, allowing its use as a locomotive of 1500, 3000, 4500 and 6000 hp merely by coupling or uncoupling. In addition, each unit can be quickly changed to any of seven gear ratios. This gives 28 speed-power combinations.

The steam locomotive of the past is unadaptable to changes of traffic and use, but this new job is easily convertible to performance ranging from 100-mph heavy-duty passenger service to heavy mountain freight work.

Wyse Cycle is just the thing for an economical way to take to the woods on week-ends. It has a 6-hp engine, heat-treated alloy steel timing gears with high lift cams, and battery-type ignition with belt-driven generator.

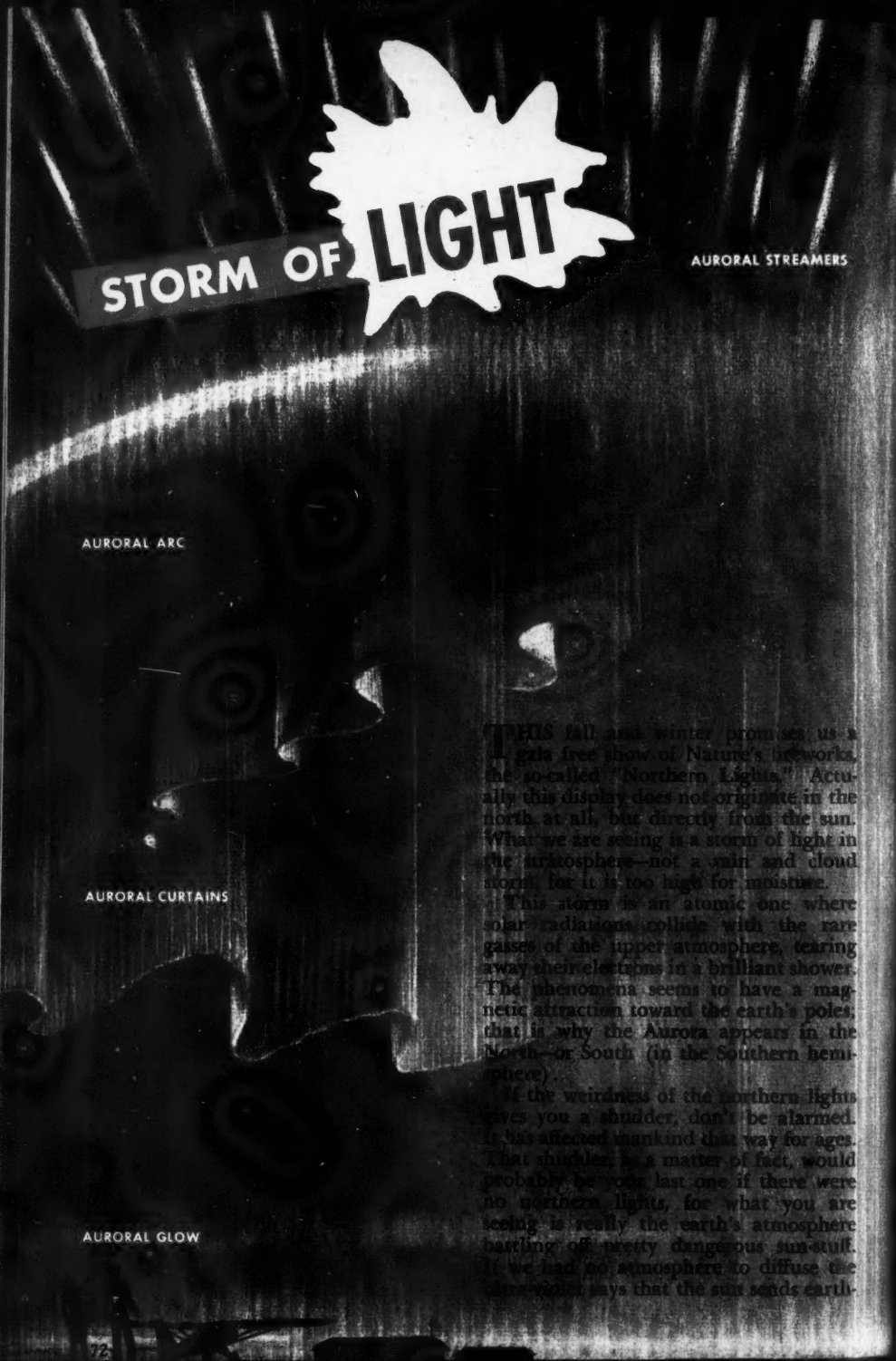


Frost Dispeller, above, will protect an acre of fruit and can be made for about $100, according to Michigan State College engineers who developed it. Using infrared heat generated by an oil flame, it raised temperatures 8 degrees.

Midget Hercules, electromagnet capable of exerting a pull of 4,000 lbs., is demonstrated above by Dr. J. E. Goldman, Westinghouse physicist. The instrument placed between the poles measures the "pull."

Airy Houses, left, originally built as cabins for tow boats, are housing veterans at Alabama Polytech. This is one of the emergency measures employed to serve over 2,000,000 men and women going to school under the GI bill.

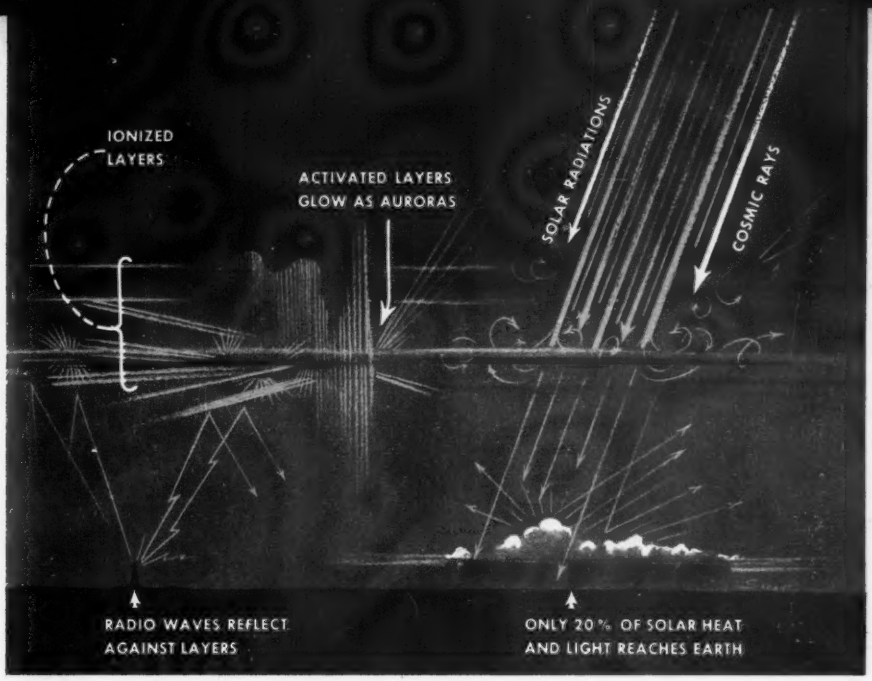
STORM OF LIGHT



THIS fall and winter promises us a gala free show of Nature's fireworks, the so-called "Northern Lights." Actually this display does not originate in the north at all, but directly from the sun. What we are seeing is a storm of light in the stratosphere—not a rain and cloud storm, for it is too high for moisture.

This storm is an atomic one where solar radiations collide with the rare gases of the upper atmosphere, tearing away their electrons in a brilliant shower. The phenomena seems to have a magnetic attraction toward the earth's poles, that is why the Aurora appears in the North—or South (in the Southern hemisphere).

If the weirdness of the northern lights gives you a shudder, don't be alarmed. It has affected mankind that way for ages. That shudder, as a matter of fact, would probably be your last one if there were no northern lights, for what you are seeing is really the earth's atmosphere battling off pretty dangerous sun-stuff. If we had no atmosphere to diffuse the ultra-violet rays that the sun sends earth-



It's a darned good thing we have the Northern Lights—otherwise we'd be burned to a crisp.

BY ERIC SLOANE

ward, both human and plant-life would suffer; during sun-spot periods when the sun erupts great pools of solar materials the earth would be bombarded unmercifully.

Last year there were spots on the sun visible to the eye without the aid of a telescope; one spot covered an area about 28 times the size of the earth's surface. Such an eruption must have been of gigantic proportions, with volcanic material reaching a probable 500,000 miles altitude beyond the sun's surface. Later the radios and compasses upon the earth were affected, even "blacking out" completely. Those in the know watched the night heavens for magnetic fireworks; sure enough they appeared, glowing from 40 to 600 miles out from the earth as the upper reaches of the atmosphere shuddered under the storm's bombardment.

There may also be layers of meteor-dust on the outer shell of our atmosphere, held there by electrical attraction and minimized gravitation. Such layers would be most effective in protecting the earth, and the possibility of their existence is pronounced by the fact that daily over twenty million space-fragments meet gravity, hurtle toward us and disintegrate when they hit the cushion of atmosphere. A part of the dust in your room right now is meteor dust. Certainly the upper layers must be thick with meteor material and possibly the Aurora occurs within these protective "clouds."

The V-2 type rocket has already pierced the roof of the stratosphere (60 miles) and has reached the area of ionized layers (the ionosphere) where meteors burn and the "northern lights" begin to glow. This fact and the fact that the sun is on a rampage now which is likely to reach a climax this year, should afford our upper-air meteorologists a feast of research.

All weather is caused by the sun, but the weather that we upon earth have had to contend with has been only a mild solution of the complete energy that the sun supplies. Even the low clouds and dusty air within the troposphere act as protective layers, reflecting back 80 per cent of solar light and heat that enters the atmosphere below sixty thousand feet.

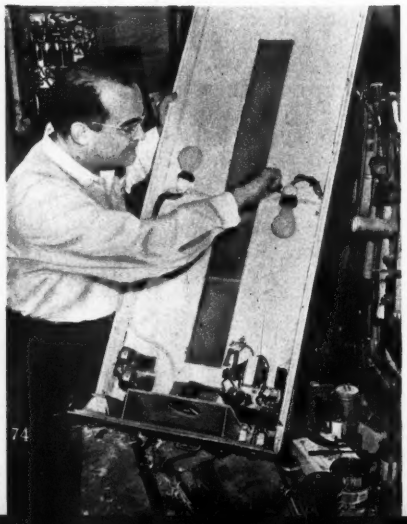
When rockets are perfected to carry men, a new era in meteorology will arrive.

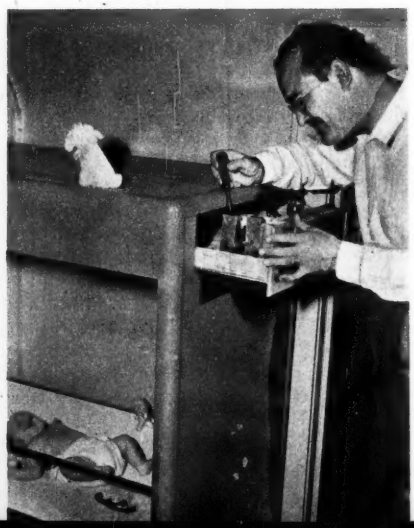
Just for a picture, papa and mama break a rule: they lower the house's glass walls.

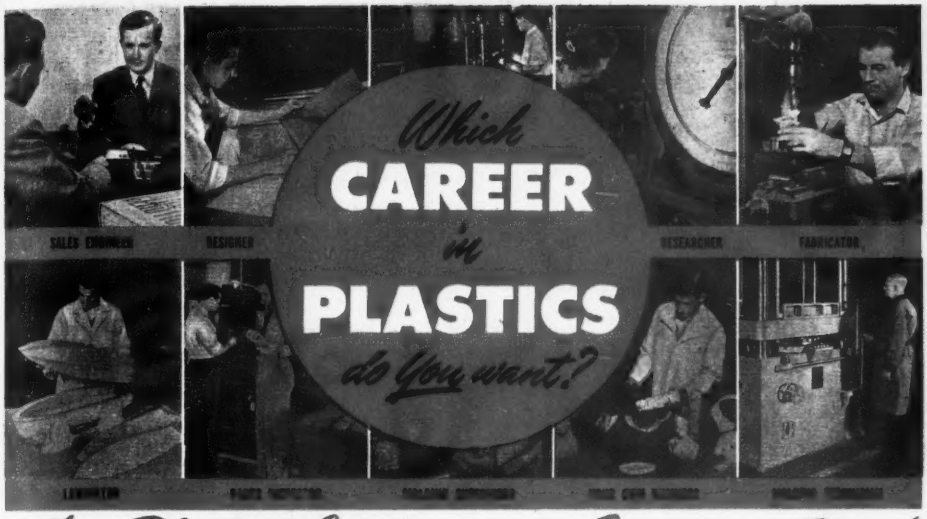
showcase baby

LITTLE John Gray Jr., three months old when these pictures were taken, has seldom been outside of this glass house in which he lives. His showcase home is temperature and humidity controlled, dirt-free and has a built-in air filter. It is partially sound-proof—he can bellow without straining the family nerves. He doesn't catch cold; visitors can't pass their germs through the glass and the house's temperature never varies from 84 degrees. At the slightest deviation, a bell rings. There are no draughts and neither is there the fear of smothering; there are no bed covers. Papa John Gray Sr. built the ingenious baby house in the workshop of his home in Sea Cliff, Long Island, New York. Only time will tell whether the child will escape the usual ills.

Papa Gray adjusts the indirect lighting and —at right—he sets the heat control thermostats.







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FREE BOOKLET
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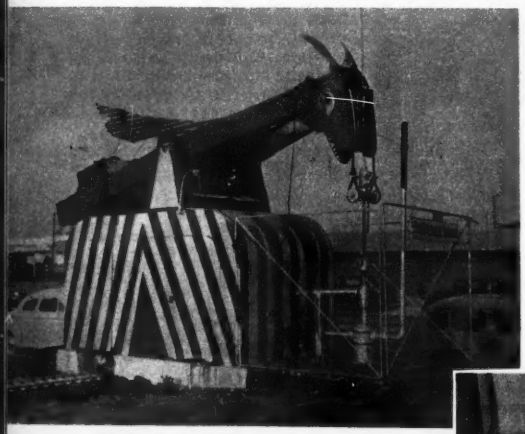
Portable Heater, shown at left and claimed to be the ideal thing for that "cold" room, is light enough to carry around and small enough to fit in the trunk of your car if you go up to the cabin on a cold week-end. It's electric—plugs into either AC or DC and it never gets so hot it will burn you. It will never scorch stockings.

Camera Topcoat at right protects lens and film while pictures are being made of atomic bomb explosions. The 35 mm. automatic data recorder, as it is known, takes shots every 90 seconds for 80 hours without being touched.



Wacky Hollywood even makes an entertainment feature of an oil well pump, ordiharily an ugly but practical tool. It's at a children's park and they love it, for as it goes up and down it wiggles its ears and opens its mouth—and pumps 75 barrels of oil every day, too.

Plastic Animals that kiddies put together themselves absorb the attention of Fav Schwebel and Garry Rosenfeld at right. The animals can be placed in amusing positions, and provide manual training as well.

worm boarding-house

Not pretty girl and large sausage—not pretty girl and large carrot—but pretty girl and Urechis, the hero of our story and quite a guy.

Urechis is not one for race prejudice. Left, we see him at home with his pals, happy, his feeding tube out, his pals' mouths watering.

IT'S certainly a screwy setup.

Down in the sea live some sausage-shaped creatures called spoonworms. There are a lot of relatives in this widespread family, and many of them are characters; but the most peculiar one, and the one we want to tell you about, is a character called Urechis.

Urechis lives in a U-shaped burrow in the mud of the bottom. His home runs up to three feet long and is permanent. Now, it's peculiar—maybe it's a housing shortage or maybe it's only loneliness—but Urechis usually invites three friends to come live with him as permanent guests. Wife and concubines, you'll guess. No, sir. Fellow Urechidae with similar interests, then? Not at all. But who else?

Well, there's variety. One of his friends —or are they only boarders?—is a poor-relation midget worm, so tiny and of such different ancestry that you'd swear they'd not be compatable. The two others are always small crabs—but different kinds.

There will be an occasional small fish, called a goby, live there, and sometimes a baby clam—but that's all. The menage is exclusive. No one else is permitted.

Among themselves the assortment lives quite happily, the guests waxing on the tidbits their host drops or discards. The fish eats outside as a rule, but the others always eat in. And they stay in.

How does Urechis himself eat?

At one end of him, near his proboscis or digging tube, there is a zone of "compound mucous glands" which secretes a fairly long transparent mucous tube. This tube strains the minute food particles from the circulating currents within the burrow. When it is loaded it is swallowed. Then a new tube forms.

Urechis eats. His pals eat. And the whole business goes on and on.

Portable Heater, shown at left and claimed to be the ideal thing for that "cold" room, is light enough to carry around and small enough to fit in the trunk of your car if you go up to the cabin on a cold week-end. It's electric—plugs into either AC or DC and it never gets so hot it will burn you. It will never scorch stockings.

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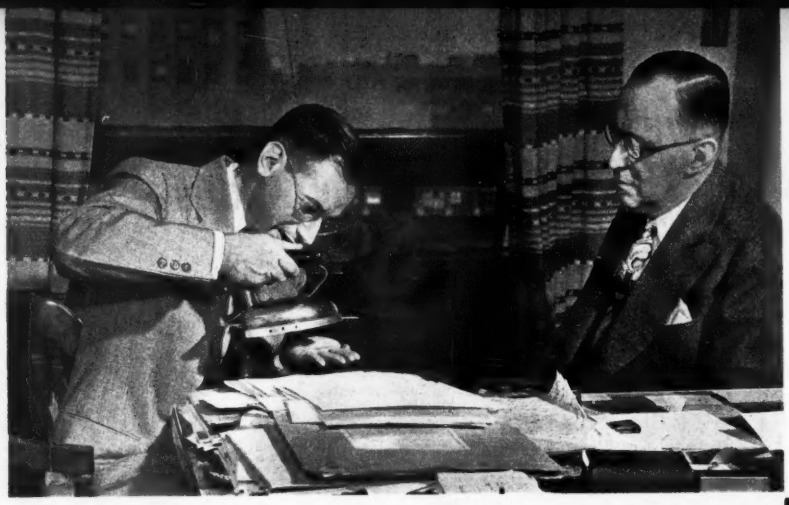


AT LAST there has been created a way to help the inventor find a manufacturer for his product. And the plan works out well, too, for the manufacturer seeking new products.

There may have been a time when the world would beat a path to the door of the man who built a better mousetrap, but that doesn't happen any more. Today, the inventor who wants to cash in on his patent must either scratch around for a manufacturer or set up as a manufacturer himself.

Either one is enough to scare him into inactivity. The first is risky, because not all manufacturers are trustworthy in their contractual dealings; the second is too costly, since inventors are notoriously low on funds.

Alfred R. Babcock, a Chicago tax consultant, has long been concerned with the gap between the unproduced invention and the producer, and now he has formed the non-profit National Foundation for Science and Industry whose express purpose is the bringing together of the inventor and producing industrialist.

Babcock himself is an inventor. "I know first hand what a hard time inventors have getting manufacturers to listen to them," he explains. "Too many manufacturers have been pestered to death by crackpots, so now they don't even listen to the man who might have something really good to offer."

Here is how the Foundation works: If an inventor has patented an idea or officially applied for a patent on it, but it has not yet gone into manufacture, he may write a 50-word summary of what it is, the materials required for making it, and its uses, and send it to the Foundation's headquarters at 160 North La Salle Street, Chicago 1, where it will be funneled into a monthly "Inventors' Digest." This service doesn't cost the inventor a cent.

Each issue of the Digest will run to as many as 64 pages and carry as many as a thousand summaries, subdivided according to the materials of which the inventions are made. The Foundation publishes the Digest and mails it each month to its associate members—manufacturers who are looking for new products to keep their shops and assembly lines busy. For $200 a year they have access to the thousands of inventions contained in the monthly Digest.

The sales value of most current products lessens with time, and firms are constantly on the watch for replacement items. Other firms, especially new and still-expanding ones, seek to extend their lines, to get better value from their sales and administrative forces. Babcock states:

"Those manufacturers who already have joined say the annual membership fee is little enough if it uncovers just one good marketable product for them."

The purpose of the Foundation, as set forth in the charter, is to contribute to a

MARKET YOUR PATENTS!

Even with a good patent the inventor has trouble finding a manufacturer. Now comes an "inventors' go-between" to the rescue.

Below, an inventor perfects a new kind of fast-action electric iron. Left, he describes it to Alfred R. Babcock, for listing in the Inventors' Digest.

high level of employment, production and income by stimulation of invention and innovation and by encouragement of creative thinking.

Babcock foresees a "boom-bust" cycle of business threatening once more, and his answer to this threat is to spread industry so broadly, over so many products, employing so many people, that though one part of the national economy may sag there'll be plenty else going on to hold the rest up. And the first step is to give full help to the inventor.

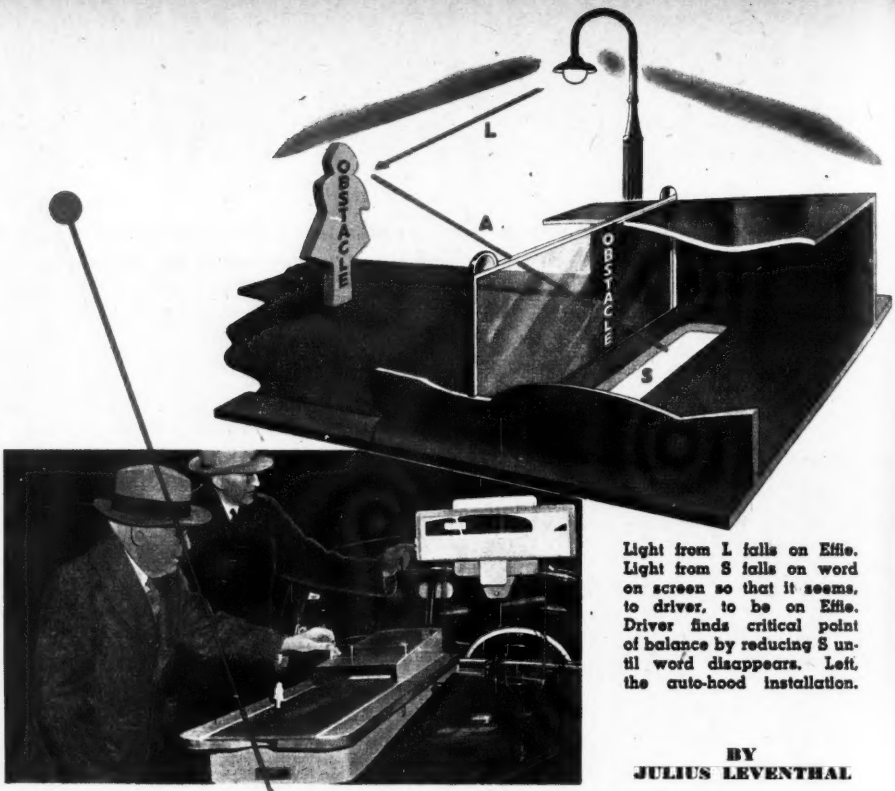
The Foundation is non-profit-making; any surplus over operating expenses will go as research grants and scholarships at various colleges and universities.

Inventors who seek patent help from the Foundation will be referred to the secretary of their nearest patent bar association. "We are not in the business of obtaining patents for people," Babcock says, "but we will try to keep a close watch on the relations between inventor and manufacturer in order that no lopsided bargaining takes place.

"The reason we accept only patented or patent-applied-for ideas is that this eliminates a lot of the so-called crackpot ideas which never could be patented or be made practical."

There are two other reasons for the limitation. It protects the inventor from anyone's stealing his idea from the Digest, and it has value for showing the manufacturer that the inventor has had faith enough in his idea to go to the expense and hard work of drawing a plan, building a working model and obtaining a patent.

Happy ending. The inventor proudly sees his iron out in money-making competition.



Light from L falls on Effie. Light from S falls on word on screen so that it seems, to driver, to be on Effie. Driver finds critical point of balance by reducing S until word disappears. Left, the auto-hood installation.

BY
JULIUS LEVENTHAL

LITTLE EFFIE TESTS THE LIGHT

IF THE streets of your city have appeared brighter recently, you may perhaps credit a little wooden doll, not more than two inches high. Effie is her name. Effie has a role with a General Electric street lighting evaluator now being offered to mayors and traffic and safety engineers.

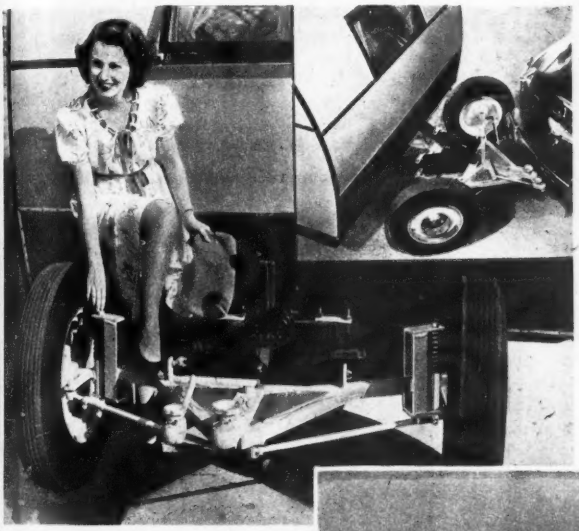
Mounted on the hood of an automobile is a strip of simulated pavement—one of a number of strips covering every variety of road material commonly used. The strip is tilted by means of an adjusting lever to an angle which puts it in the same position relative to the driver as is the actual roadway just ahead. By regulating a light mounted beneath the strip, the operator of the car causes a word, "pavement," printed on the pavement, to disappear from view. This point of disappearance is called the point of photometric balance and, when recorded on a card, indicates the exact strength of the street lighting.

Now let us see how little Effie fits into the picture. She is placed on the strip of simulated pavement near the entrance of a tunnel so built as to block out any distracting light. The word "obstacle" is printed vertically on a transparent screen fitted into the hood in such a way as to appear to be imprinted on the body of Effie herself. Again, by adjusting a light source, the operator can cause the word to disappear. This point of photometric balance is also recorded on the card.

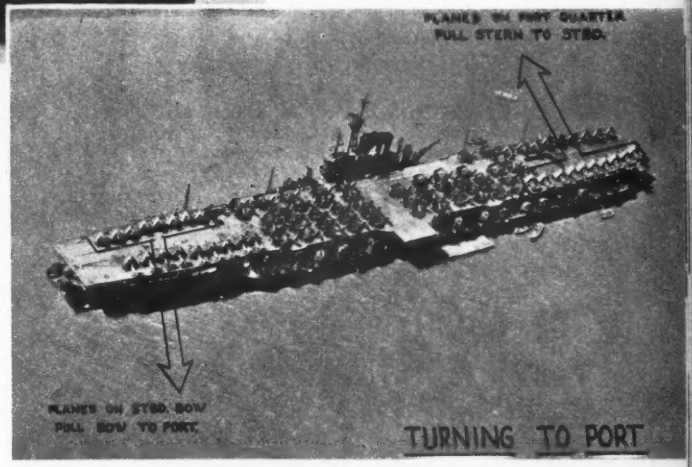
A third feature of the evaluator, working on the same principle, measures glow by means of a periscope and focusing device mounted on the windshield of the car above the operator's head.

So—when you see an automobile at night with a flat board on its hood and some queer gadgets on its windshield, look carefully. Perhaps you will see Effie helping to save your life.

Cranberry Picker that draws them in like a vacuum cleaner and kills bugs at the same time is demonstrated at right by Antone Lenari, engineer, in a bog near Hanson, Mass.



Knee Action trailer that steers in coordination with the car's front wheels is displayed at left by Adele Eaton. The wheels are turned by a hitch-ball arm installed on the auto. There's no sidesway at high speed is the claim.



Mighty Wind stirred up by 36 airplanes on the USS Midway, world's largest carrier, is called "Operation Pinwheel" and serves to turn the huge ship around in tight spots within the harbor. First used as an emergency measure in Guam in 1945, the maneuver has been adopted by the Navy as standard procedure. It can be used with harbor tugs.

Murder Plot is on the mind of this mystery story writer who went to all the trouble of building this miniature house so she can keep track of the villains, victims and suspects while planning just where the butler will be when the gun is fired. She's Vera Caspary of Hollywood.

Firefighting Helicopters

Guardians of our national forest reserves now have a versatile weapon to pit against nature's ancient and devastating enemy—fire.

BY DAVID P. GODWIN, Asst. Chief, Div. of Fire Control, U. S. Forest Service, as told to James N. Miller.

THE newest and most promising tool for the protection of our national forests is the firefighting helicopter. Its practicability has already been proven in tests conducted by Army and Forest Service officials.

The greatest value of the rotary wing aircraft lies in its ability to hover and land almost anywhere. Visibility is not a serious problem for the craft literally can feel its way through darkness or cloudy flying weather by circling around trees, mountains

Asst. Chief Godwin, above, is a firefighting veteran of 20 years' service. Lt. J. E. Chudars, right, Air Rescue Service, was pilot in recent successful tests.

and other obstacles. In these respects it is superior to the airplane which has been used by the Forest Service for some 25 years.

Heading up the helicopter-forest project is Colonel Wallace S. Ford, commanding the Air Rescue Service, AAF. I serve in a like capacity for the Forest Service with headquarters in Washington. In charge of the actual experiments are Major Fred W. Milam, AAF, headquartered at March Field, Calif. His able associate is Clare Funk, Forest Service equipment engineer for the California region.

After reviewing the results of our program, covering a period of about five months, we feel that the helicopter is about the most versatile type of flying machine for our work. It is capable not only of vertical rise and descent within an area slightly larger than that swept by its rotors, but also of hovering, climbing, gliding and flying backward, forward or sideways.

The Forest Service is not planning to

maintain what might be called a helicopter "patrol." The role of this type of flying machine in fire control work, as compared with that of the airplane, is about the same as that of the city fire engine as contrasted to the fire patrol car. It's most likely to become largely a standby proposition, with the helicopter always on tap as a "hot shot" unit, ready for quickest possible use for transporting men and firefighting equipment to remote sections of our national forests otherwise inaccessible by air, water, trail or road.

For several years Forest Service officials have conferred with manufacturers of rotary wing aircraft concerning their fire problems. At the moment it seems most likely that the Army's R-5, a Sikorsky model, such as we used in our tests, will be the first to actually go into forest protection work. The R-5,

with 450 hp, is the prototype upon which the first Sikorsky commercial model, the S-51, is based. The latter has a cruising speed of 80 mph, a service ceiling of 13,000, a cruising range of over 200 miles and its fuel consumption is roughly 28 gallons per hour. It carries a fuel weight of around 500 pounds and has accommodations for a pilot, three passengers and a baggage weight of 70 pounds.

eration for maintaining helicopters are the Northern Rockies, which take in sections of Montana and Idaho; the Northern Cascades, running through Oregon and Washington, and the Sierra Nevada range that hooks into the Cascades, running southward through California. Other possible regions are the Central Rockies in Colorado and the mountainous areas of New Mexico and Colorado.

Below: Air Rescue 'copter lands at scene and discharges crew. Right: Craft returns and drops tools to firemen.

At present there are comparatively few competent helicopter pilots and mechanics. I would guess that there are probably not 200 pilots who have checked out on the helicopter. However, 30 hours of training is sufficient to make a helicopter pilot out of a good airplane pilot, so we don't expect this to be a problem in the future.

Because it can land and take off in very restricted areas, the helicopter could deliver men and supplies in thousands of spots through forested areas, such as flat ridge tops, small meadows or clearings, and in canyon bottoms.

Among the areas now under consid-

Early in our research program, Forest Service officials realized that for their type of work greater lift and better all round performance were a "must." Sikorsky answered our prayer and equipped some of the experimental R-5's with a newly designed type of rotor blade, offering much improved lift characteristics—so much so that at 7,000 feet with the new blades we were able to achieve about the same performance that we got with the old type at heights of only 4,000 feet.

As a rough performance specification you might say that the Service is now seeking a helicopter that will behave as

well at 8,000 feet as present ones do at 1,000 feet in take off, hovering, landing and cargo hauling. We are confident the industry will be able to develop this type of super-craft in the reasonably near future.

We most certainly expect radical changes in the shape of tomorrow's helicopters. Already on the drawing boards are cabins almost exactly like those found on regular

Casualties are evacuated from remote sections on the litter tray shown at right.

cargo and transport airplanes. We in the Forest Service are thoroughly in accord with this idea. For we need as much open space as possible for men and cargo. A little later on there seems to be no engineering reason why the industry cannot produce a helicopter with a payload of 2,000 to 3,000 pounds. Which would mean that we could transport ten "smoke-chasers" with complete equipment for each man.

Tomorrow's firefighting helicopter no doubt will go much faster than today's. However, speed is not the main thing we're seeking. A speed of 100 mph. is just about adequate for our purposes.

Many other potential forest uses loom for the helicopter. On large fires men could be shuttled back and forth between fire camp and fire line, and prepared food taken to smoke-chasers on the job. For various types of observation, the helicopter would be ideal. These include detection of fires, scouting big areas already burning and prevention and law enforcement in sections where incendiarism is suspected.

Millions of dollars have been invested in roads and trails constructed primarily for fire protection. A well planned and skilfully managed helicopter operation could provide a degree of protection justifying reduced road-building and abandonment of some existing roads.

Below: The Platt Le Page XR-1 is one of many types being studied for fire patrol service.

double-wing monoplane

Rear view of Delanne's prewar sport trainer showing the winglike tail with its ailerons.

BY C. B. COLBY

WHEN the Nazi horde overran France in 1940 they hoped to find some aeronautical loot worth stealing. They were disappointed; but there was one thing that seemed to have potential value—a fantastic looking affair that bore the name and characteristically novel touches of one Maurice Henry Delanne, aeronautical genius and loyal Frenchman. For many years this adroit gentleman had been presenting outstanding aircraft to the world—the first semi-monocoque wing, outstandingly successful gliders, and any number of conventional aircraft of various types.

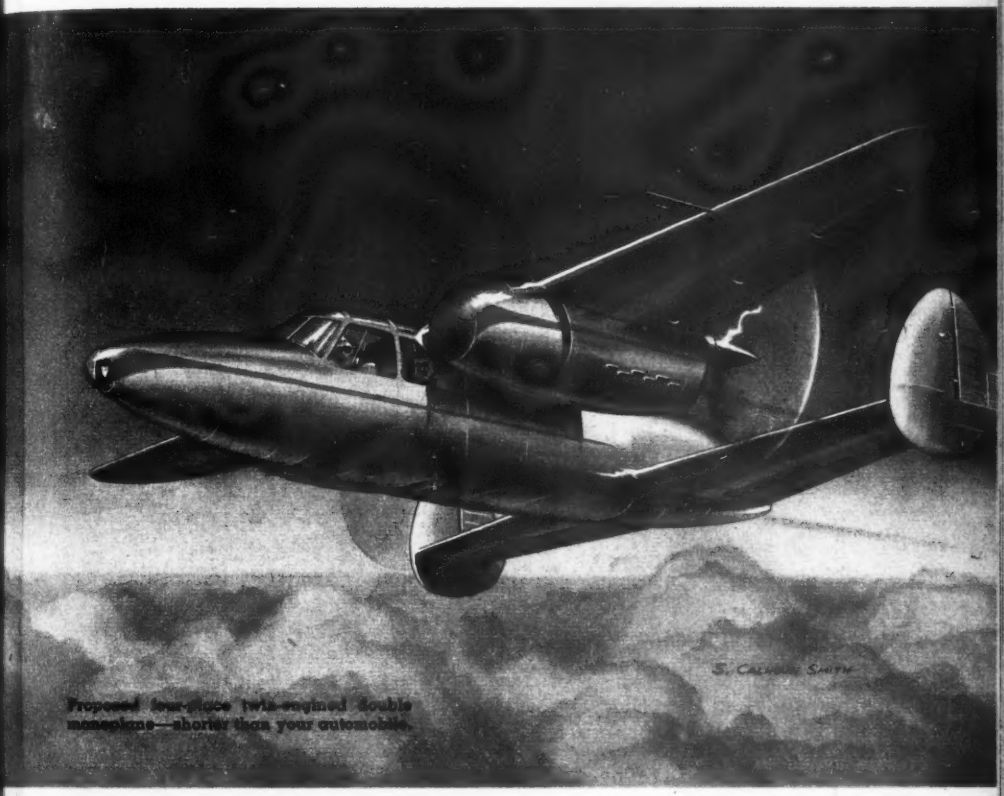
Ordered to cooperate with the Nazis, Delanne stalled for a year, then engineered the "accidental" destruction of his only prototype and wound up in a Nazi jail. During the three years he spent there he put his nimble thoughts on designs for future aircraft not for use by the Germans.

The aircraft known as the 10-C-2 which the German invaders *thought* they had, was really remarkable. Its double monoplane wings and tail-less fuselage was powered with only 860 hp, but could carry a pilot and rear gunner, a 20-mm. cannon, four .50-cal. machine guns, and a four-gun electric rear turret. Loaded down with this collection of military hardware it could still rip along at better than 365 mph, and yet land at 60 mph. Note that last figure, *land at 60 mph.* That's a mark of Delanne's genius. The great range from top speed to landing speed makes this aircraft headline news.

Plenty of aircraft fly faster than this with more power, and plenty can land slower with less weight, less power and less top speed, but Delanne's gives the unbeatable combination of high top speed, low landing speed, comparatively small horsepower, and heavy load. There's even more. In most aircraft, balance requirements allow use of only

Side view of the aerobatic sport model that mushed to a perfect landing from an altitude of 180 feet.

He made a wing out of the tail—and gave it ailerons—and knocked the records for a loop.



Proposed four-place twin-engined double monoplane—shorter than your automobile.

a small percentage of the fuselage, but in the double monoplane model practically all of the fuselage space is usable. This means more crew, more passengers, more cargo, or more guns and bombs.

The "how come" of the double monoplane is simply this: the rear wing takes the place of the horizontal stabilizer and not only serves as a support for the elevators and rudders but contributes a sizable chunk of the ship's overall lift. As Delanne's models feature ailerons on both forward and after monoplane wings, maneuvers are possible without dangerous twisting effect on either surface. In his aircraft the cleverness of the designer is shown by the spacing of the two wings in relation to each other. In normal flight they are located in such a way that neither interferes with the other from an aerodynamical standpoint; in fact they work to advantage.

One design of Delanne's labelled the "20 EXP" was given a thorough workout during acceptance tests in 1937 against monoplanes and biplanes. Designed as an aerobatic trainer this model walked away with the most difficult part of the test—the clearing of an obstacle 65 feet high at one end of the 1,250-foot runway from a dead start at the other. With only a 180-hp powerplant the 20 EXP not only cleared the obstacle but did so with 115 feet to spare—and then, as if to really rub it into the competition, Delanne cut the throttle over the obstacle and mushed 180 feet to a perfect landing.

Designer Delanne is now in this country working on both military and commercial versions of his early prototypes.

Remote Keyboard of this electromatic typewriter makes it possible for disabled, bed-ridden patients to type their own letters while lying in almost any position. This veteran, Russell A. Ludden, a patient at the Bronx Veterans Hospital, is shown being given a typing lesson by Miss Margaret Dale, instructor of commercial subjects.

Dry Ice Gun saves the day when flash fire threatens to burn the turkey as the oven door is opened. The shower of dry ice particles quenches the flame without harm to the food. Water would only spread grease flames. Blasting away at this particular bird is Ann Browning of New York.

Three-In-One Boat telescopes neatly into a lightweight package easily lifted and carried on the car top, as demonstrated at left by Edward Cormier and his brother Oliver, both of Dorchester, Mass. Each part of the 66-pound, welded aluminum craft will support a man as shown above by Oliver. The boat was made by the two brothers and their father, O. A. Cormier of Fitchburg Mass.

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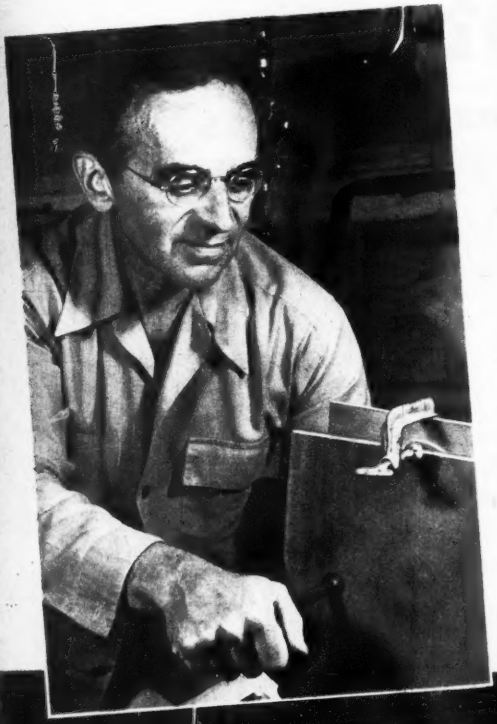
Lawyer at a Lathe

BY FRANK HALL FRAYSUR



MORRIS ERNST is an energetic, happily-balanced individual who, at the age of 57, manages to live the kind of life that any man might envy. For nine months of the year he is a hard-hitting New York lawyer, famous for his many civil liberties cases, the other three he spends in the summer home and workshop he built 17 years ago on cool Nantucket Island, off Massachusetts, puttering to his heart's content with anything he pleases—which means, specifically, either his 30-foot sailboat or his carpentry and woodworking.

"In New York I work with my tongue," he says; "on Nantucket I work with my hands.

"I figured it all out 20 years ago. Nearly all the business friends I know have the theory that they will retire somewhere around the age of 50. I observed that most of them either went broke after they got their income, or else died of sheer boredom not long after they retired. I decided to gamble the other way. So, I work nine months of the year

Ernst prefers to work in wood. "Lumber is alive, compared to clay or marble or metal," he explains.

Noted attorney and model of home made in his wood-working phase.

Morris Ernst is three-quarters lawyer, one-quarter wood-worker—and four-quarters zest.

and 'retire' the other three. It's like having your cake and eating it."

The main point about Morris Ernst's retiring-as-he-goes method is that he retires to *something*: he retires to a manual activity as exciting and stimulating as his brains-and-tongue activity in city law practice. If anything, he finds himself more occupied than ever, but in a different and more relaxing way. "No man, even if he lives to be 150," he says, "will ever stagnate if he can manage to be active and alive by *doing* something. Every time you sail a boat, or go into your workshop to make something, it is a new adventure and a new experience.

"I never build anything elaborate or phony," Ernst says. "I regard carpentry and wood-working as a purely functional hobby. Carpentry should be used for turning out something you need and can use. I make stuff to live with and to eat on."

Looking around his house, this functionism is evident in one room after another. There is a corner cupboard, a buffet, a desk of his own design, a sewing-box with highly specialized compartments. Smaller pieces include pen holders, a spool for holding a roll of postage stamps, match containers, waste baskets, and salad plates and berry bowls turned out of every kind of wood from cherry to mahogany.

Oddly enough, Morris Ernst keeps his two lives distinctly separate. On Nantucket he is constantly busy with his hands and will do anything that's mechanical, but in New York he won't even change a light bulb!

"I love New York," he writes in his best-selling book, "The Best Is Yet," "but I also know that no one really lives in New York, or at least in Manhattan. People sleep there. They work there. They go to movies there. But they have no roots or homes. It's too big for anyone to belong to it, and most New Yorkers move every two or three years."

In discussing this further with him, Ernst came up with an idea so excellent I want to pass it along.

"Every cellar and basement in every apartment building in big cities like New York should be used as a workshop," he said. "Any smart and enterprising landlord would make a terrific hit by installing a free basement workshop for his tenants. People in cities would be much better off if they got home an hour earlier and worked on a new piece of furniture for the family. It would be much pleasanter living, for instance, than sitting around playing bridge—which usually winds up in a domestic quarrel."

Ernst himself doesn't "work" in New York. I remember he told me, "I have never worked a day in the past 25 years. Work is only when you do something you don't like. Otherwise it is not work at all, but fun—you are living instead of working.

"My only fear is that I will run out of projects, for I refuse to clutter up the place with useless stuff. I suppose, though, that when you have a house and a sailboat, there will always be something else to do."

He's filled his "awfully empty" new home with things made by himself, such as this secretary.

MI LOOKS AHEAD

WITH LOUIS WOLFE

Come-apart Piano that weighs only 250 lbs. and can be put together in only ten minutes is being manufactured by Pratt Reed and Co., Deep River, Conn. Its chief weight saver is a magnesium string plate. All parts are held together by metal pins and dowels.

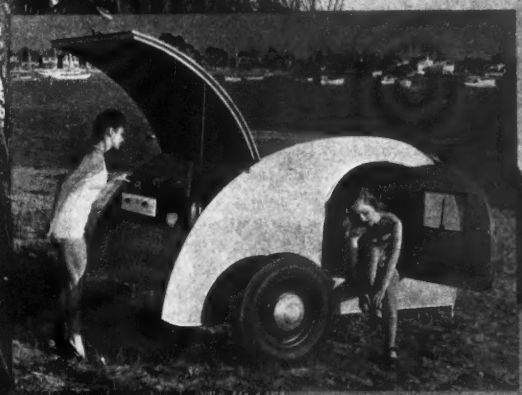
Rayon Covered Walls will soon be the delight of housewives. The gun sprays rayon fibers 1/16 inch long on the walls which are coated with glue. The process makes a smooth, velvety surface of any color which can be cleaned with soap and water.

Automatic Window opens and closes all by itself. When it gets too warm, a thermostatic device quietly lifts the windows and when the temperature drops, it softly closes them. Its development has been announced by Consolidated Engineering.

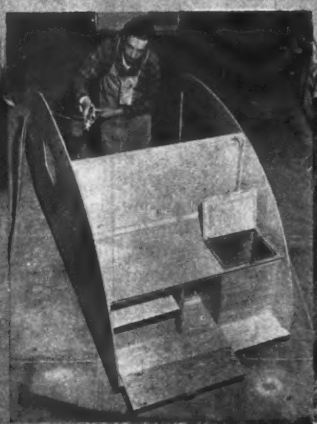
Radio Paging Service will enable you to enjoy a show, baseball game or tete-a-tete and still know whether you're wanted on the telephone. A small receiver is regulated to call your code number only. When it's silent, continue to relax; when it signals, better find a phone.

VEST-POCKET TRAILER

HERE, at last, is a rain and dust proof vest-pocket trailer which combines galley, pantry and sleeping quarters. It's the "Kit-Kamper" and weighs just under 600 lbs. The roomy, two-place berth, containing an inner-spring mattress and full width clothes hamper, has ample head clearance and dressing space. Two screened windows provide cross-ventilation. The rear of the trailer features an insulated 25-pound ice chest, built-in pantry and stove compartment, all completely dust-proofed.



The stain-proof aluminum shell, laminated to plywood, provides insulation against heat and cold. Trailer body receives final touches, below.



It sleeps two persons and is light enough to leave the paving and take to the byways.

pegasus on wheels

From [illegible] to airplane in five minutes—that's like Airphibian.

Left: Dan Fulton, Airphib's inventor, gets all set to take off. Look at that instrument board!

THAT old crack about "did you ever see a horse fly?" is moldy with age but there's a new version out now that has to do with an auto flying and it's no joke. Thanks to some clever engineering skill we now have with us, after various false starts from other parts of the country a practical, good looking, and workable combination auto-aircraft.

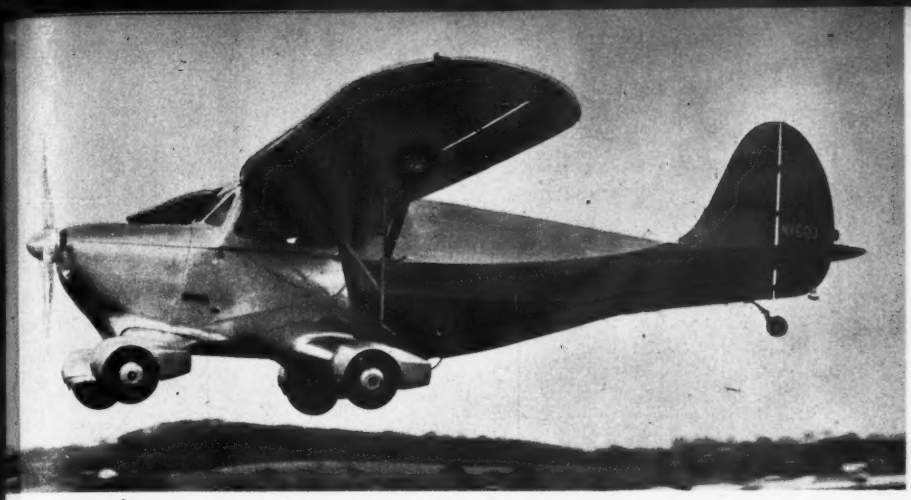
Up at the Danbury, Conn., airport a small group of young, smart and secret loving engineers headed by Robert E. Fulton, Jr., a descendant of the Robert Fulton who invented the steamship, and working under the "tell-nothing" letterhead of Continental, Inc., have produced what they have aptly named the Airphibian. Although not much technical data is available, enough of the story can be dug out of this reticent gang of youngsters to make the eyes of the older generation of aeronautical engineers hang right on their cheeks.

This amazing aircraft-car combination is designed as a complete unit but is so constructed that in less than five minutes it may be transformed into either a snappy all metal coupe ready for the highway or a sleek high-wing monoplane ready for the runway and beyond.

Each section of the two-part entirety is complete unto itself. The front half or roadable section, as a car, has the usual auto complement of four wheels, tire chains for winter driving if need be, canvas convertible top, ash trays, cigarette lighter, windshieldwiper, bumper, tail and head lights, horn, rearview mirror and radio. The four wheels are on the ends of streamlined struts and are half covered with streamlined pants. The headlights are set into the nose under the prop hub and there are also two small lights mounted in the front of each forward wheel pant. These are mainly so that night traffic can tell the width of the car part of the aircraft and not take it for a motorcycle with two close-together lights.

The passenger cabin of the Airphibian is complete with two-way radio,

Below: Fulton steps in for a 50-mph ride into town after the 5-minute changeover.



Pegasus takes off on its first test flight at Danbury, Conn. Cruising speed: 125-mph.

heating and ventilating units, flight, navigation, and engine instruments for both highway and flight. It is finished with brown quilted upholstery and the two seats have ample leg room. The control is a single wheel type and the rudder pedals, for flight, are also the clutch and brake pedals when on the ground. A foot accelerator for highway driving is also handy for taxiing.

The conversion is quickly done with out additional help, jacks and special tools. There is, however one special tool that is unique, and darned helpful. It is a special wrench built into the propeller hub so that it may be quickly removed when on the ground. Once removed the prop is hung on a special bracket on the side of the temporarily abandoned rear part and left in the hangar while the coupe hustles off home with the pilot.

In the air the Airphibian gives an appearance of unusual ruggedness and stability, and seems to respond smoothly to the controls. I watched it for more than an hour circling the field and shooting landings. The glide path was rather steep and seemed to be at a speed of about 60-mph, while the landing speed seemed to be in the 45- to 55-mph class. Cruising speed is said to be 125-mph, while the highway speed will keep you just under the 50-mph limit on most open highways.

The weight of the ship plus 30 gallons of gasoline is tagged at 2,200 lbs. and while the engine is more powerful than that of a Cadillac, it weighs less than a Ford on the highway. The engine at time of writing is not known but from flight performance a powerplant of at least 150-hp would be indicated. No price as yet has been set.

At present the Airphibian flies with an NX number on its wing but once it has been really put through its paces, an ATC will be applied for and within a few months it is expected the NX will be swapped for an NC. From then on anything may happen to the personal aircraft market.—*C. B. Colby.*

It was a sensation on the highway, you can bet.

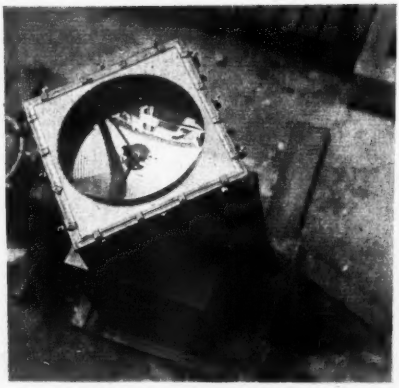
ceilometer

FOR years Weather Bureau scientists in Washington have been seeking an automatic way to measure the height of cloud layers. Vital reason: knowledge of the height of cloud ceilings and the rate at which they lift or lower is essential to the safe arrival and departure of aircraft at landing fields.

Now, after more than three years of experimentation, their problem seems to be solved. A delicate electronics instrument known as a "ceilometer" has been developed that can measure the heights of clouds up to 20,000 feet in full daylight and up to 30,000 feet at night. It will soon be in operation at 140 weather stations throughout the country.

The ceilometer consists of two separate instruments, a powerful arc light projector which flashes a beam of light into the sky to reflect from the base of a cloud layer, and a photo-electric cell or "electronic eye," mounted in a telescope-like apparatus, that picks up the reflected light beam. From the angle thus measured and knowledge of the distance between the electric eye and the projector, the cloud height is obtained.

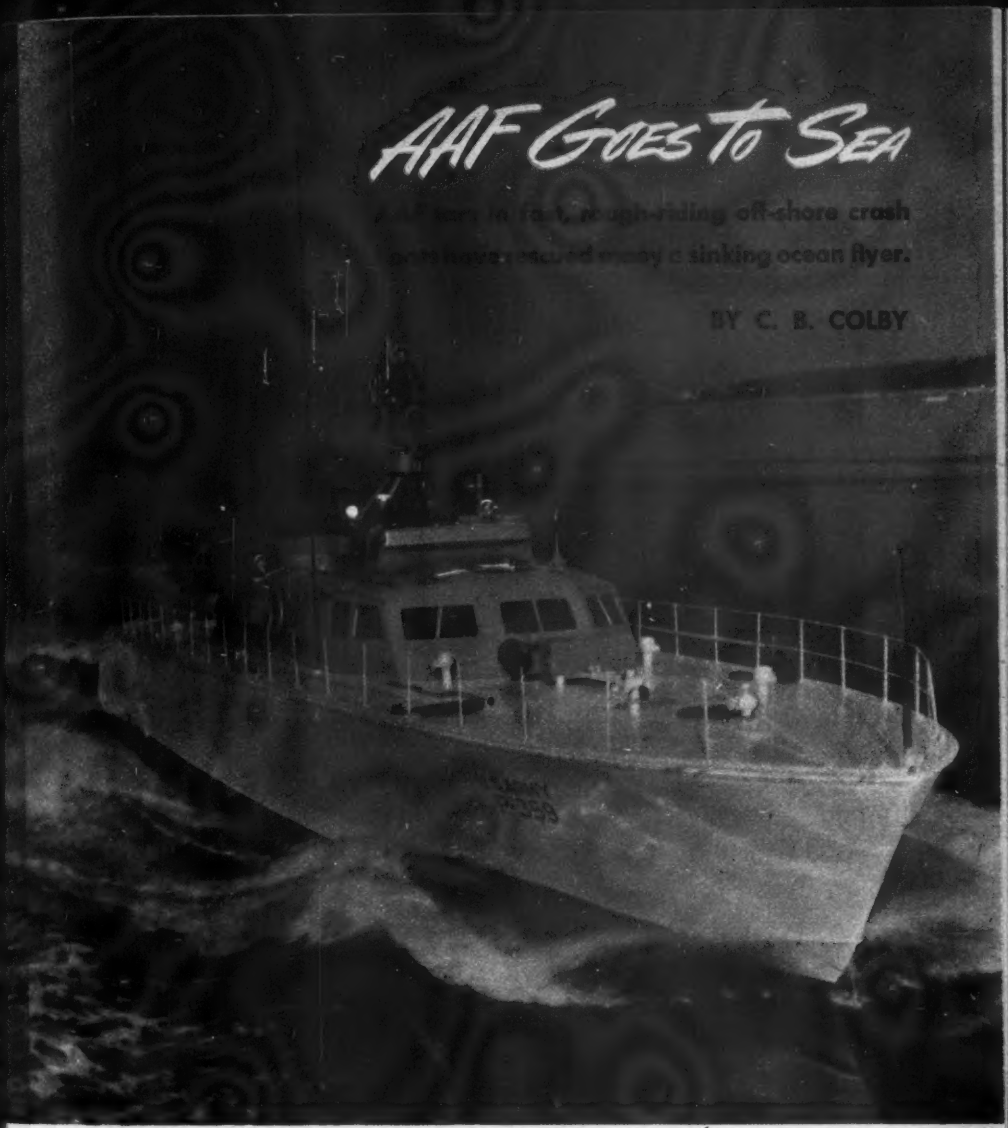
Above: L. W. Foskett, Weather Bureau scientist, inspects a ceilometer. Right: A 900-watt arc projector.



AAF Goes To Sea

[illegible] in fact, rough-riding off-shore crash [illegible] have rescued many a sinking ocean flyer.

BY C. B. COLBY



Photos by Rudy Arnold

IT COULD be a "64-dollar question": "What's a sailjer?" In a radio quiz the right answer would pay off in cash. In the AAF the right answer has already paid off in cash—and also in human lives—for a sailjer is a sea-going soldier of the AAF, a most unusual three-way hybrid of the war.

Men thumbing through a history of the AAF may some day stop in amazement. What's this Navy jargon?—"speeds of 30 to 40 knots"—"draft of three and a half feet"—"twin 36-inch screws"—"1500 hp Packard marine engines!" If Zerby could talk and wasn't busy sleeping off a beer hangover he could tell you all about it.

Zerby is the beer-drinking canine mascot of the strangest and one of the most valuable gangs of sea-going GI's in history. You see it's like this:

There was a time back in the hectic days of 1942 when the air around New York and well out to sea was filled nearly every hour of every day with test flights and the sharp ackety-ack and heavier

roomph-roomph of Army and Navy planes at gunnery practice and on the bombing range. And along the seaward shore of Fire Island—a so-called "barrier reef" stretching for some 60 miles between Long Island and the sea—the lights went out and the Coast Guard maintained a constant patrol of the beaches where Nazi landings might be made. This great activity brought about water crashes with tragic frequency, and the AAF soon found that rescues called for special techniques, special equipment, and personnel with special know-how. Something had to be done, and done fast.

Wheels began to grind and the grist was an air-sea rescue unit, at first known by the startling title, "921st Quartermaster Boat Company," consisting of one 83-foot boat manned by a master, mate, chief and first engineer (all Civil Service civilians with salty backgrounds), crewed by regular AAF enlisted men, based at Babylon, Long Island, N. Y., and attached to Mitchel Field. This unit was so successful that it was moved to larger quarters at Bayshore and increased to a fleet of five boats by the addition of three 42-footers and a 40-footer.

More personnel were added and the gang really got rolling when several big 104-foot boats joined up to take care of aircraft salvage as well as personnel rescue. (Salvaged aircraft though hopelessly damaged sometimes gave invaluable crash data to engineers.) This salvage work kept the larger, slower-moving boats busy until 1944, when it was practically abandoned for greater concentration on personnel rescue. The present 85-footers were then added to replace the slower craft.

These fast, tough, and rough-riding rescue craft are similar to the famed PT's of the Pacific, but they carry different equipment, are longer, and are a darn sight tougher. Talk to the sailjers who ride their bucking decks through "blue water" at 30 to 40 knots and you'll soon discover they also carry a particularly tough breed of human with them on their rugged patrols and errands of mercy.

The boats themselves are designed for the work, carry all kinds of odd-looking but highly efficient equipment for per-

sonnel rescue, and draw but three and a half feet of water in spite of their 85-foot length and 22-foot beam. Their shallow draft is important, for a certain percentage of the crashes occur in shallow water or in areas where they must be reached quickly regardless of the depth of the water. Downed aircraft soon head for the bottom, so it's always full speed ahead and to hell with the bottom!

Squadron K, the Bayshore unit, one of many spread about the country (and also overseas during the war), has in many instances served not only the AAF but the community as well. There was the time a man on Fire Island was suddenly taken with a heart attack. The two roaring 1,500-hp engines of one of the boats sped him to the mainland in time to save another life to be entered in the Squadron log. During the war such feats as bringing back the crew of a B-17 and the B-17 itself, dotted the unit's log.

The present 45 enlisted men and three warrant officers of the Bayshore station fleet are all that are left of the full wartime force of 150 enlisted men and 21 officers, but all are veterans and well able to cope with peacetime requirements. When off duty these men wear regulation Army Grade "A" uniforms with standard AAF insignia, but the moment they step aboard their craft they are Navy from white gob hat to blue fatigues. Why not?—they're Navy for the time being, and love it. Chief Warrant Officer William S. Weit, commanding Squadron K, knows his sea, boats and men, and as skipper of the Bayshore fleet has plenty to be proud of.

Left: Skipper consults chart in the enclosed bridge of a 104-foot craft; note radio direction finder to the left of the helmsman's head. Above, AAF soldier receiving his "Navy" togs.

At present the duties of the fleet take them to sea for an average of three days at a time, three boats to a patrol, leaving three at the base for "back yard" coverage. The three boats at sea cover an assigned operation area, one boat in the center and one on each flank. When they return the other three put out to take their places. All at all times are in radio contact with the other boats, the home base, air fields, and planes, and can be directed to any point in a matter of minutes. With three boats at sea they can all converge on a point, one pinpointing the "incident" in a surprisingly short space of time with two more coming up, just in case.

There's a reason they can move fast. The 85-footers—for instance—have a tightly packaged, high-revving, sizzling power plant consisting of two 1,500-hp Packard marine engines. These engines are cradled in a horizontal position and have drive shafts thrusting forward into V-gear boxes which in turn drive aft to twin 36-inch screws. The engines sit well aft, about two-thirds of the distance back from the bow. They consume about 100 gallons per hour at the cruising speed of 30 knots, and are capable of a drive of a little better than 40 knots.

Translate all this into forward motion in water—deep-rolling ocean water—and you've got something beautiful to watch, if you're on shore. If the boat's under you it's like something else—say, riding the hurricane deck of an ornery bronco. Or, as one veteran crash-boat crew member put it: "They're sweet boats but in rough weather it's like sliding on your back downhill over a washboard."

The boats have to be fast. As just said, when a plane crashes in water it doesn't stay afloat long—if it floats at all—and it's no sure thing that the pilot or passengers will stay afloat, either, even if

they do have a life raft or belts, or the plane is equipped with pontoons. The difference between life and death for the survivors might easily be reckoned in terms of horsepower.

Streaking through the water they bear a striking resemblance to the Motor Torpedo boats of Pacific fame, although they carry no torpedoes, are several feet longer, and are much more durably built.

Each boat is a complete seagoing home, business office, emergency first

Left, the bridge of an 85-foot sea rescue boat showing the Skipper giving directions to his helmsman. Below, a 104-footer with its specially installed davit in the bow.

The crew of an 85-footer line up to receive special orders.

aid station, fire department and mess hall, and the 14 sailjers who man it take the same pride in keeping their craft "chicken" as the Navy boys do in keeping their own boats that way.

Every two weeks an E pennant is given to the boat with the most shipshape appearance to fly for the next two weeks—and confidentially, the skipper has a devil of a time picking the winner.

When one of these craft drops a hook or ties up at a nearby town local landlubbers, invited aboard, are always amazed to see that soldiers can so completely become sailors by sticking on a gob's hat.

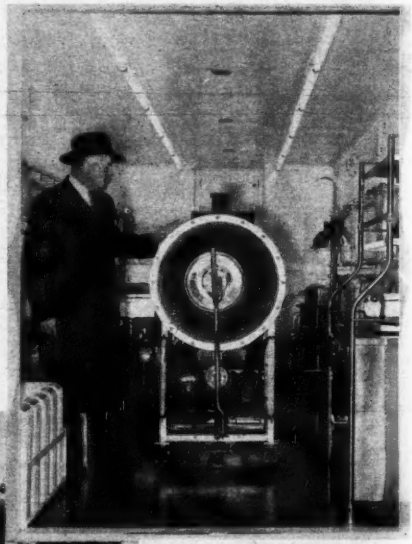
As for where they got that word "sailjer" and the particular type of guy who proudly wears it, the formula is simple: take fourteen regular AAF men, soak with high morale and a desire to drag some fellow out of the brine, baste lightly with an inborn liking for boats, pour into an 85-foot crash boat, and shake like hell at 40 knots over blue water.

Three plane crash survivors are being taken aboard. The man in the metal "crash basket" is receiving blood plasma.

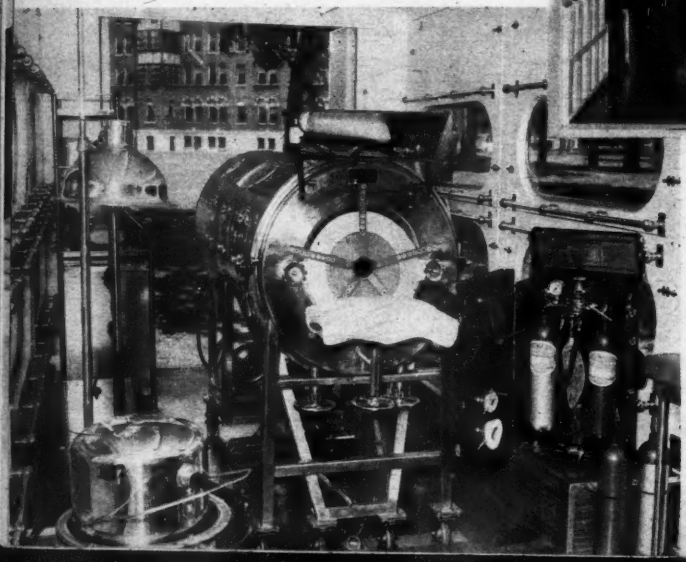
Polio-Mobile

This hospital-on-wheels brings new hope to isolated polio victims.

THE dread disease often strikes far away from modern hospitalization. This fact gave rise to the mobile polio clinic pictured here. Built into a nine-ton semi-trailer and drawn by a tractor-truck, the unit was developed by the National Foundation for Infantile Paralysis, under the supervision of Alan A. Rich. Packed into the comparatively limited space of the trailer are an iron lung, a hot pack machine for Sister Kenney treatments, a resuscitator, aspirators and a ray lamp. The mobile clinic can be rushed to sections where outbreaks of polio overtax stationary equipment. The unit has already been in action in the Peoria, Ill., area. It proved invaluable.



Relieved sufferers can thank Alan A. Rich, polio-mobile's builder, who examines the iron lung's diaphragm above.



Precious equipment in the trailer has imbedded caster wheels which hold it securely while en route.

Junior styles tomorrow's cars

Watch out, you professional car designers—these up and coming 'teen agers will have your jobs!

Prize-winning Virgil M. Exner, Jr., 13, tried 12 designs, and made his model car out of clay.

THE automobile of tomorrow should have a rear engine, better visibility and smooth and unbroken body lines—so think the youthful winners in the 1946 competition of the Fisher Body Craftsman's Guild.

The lads seem to be on the beam. Look at their models!

David W. Whitman chiseled and filed his car out of pine. Little Virgil M. Exner, only 13, turned out a job nearly the equal of a professional designer's, the experts say. Virgil is the son of the chief designer for the Studebaker Corp., and seems to have inherited his father's talents. In a well-equipped workshop, with side trips to a nearby dime store, he made a beautiful plaster of

A Napoleonic coach and two model automobiles picture the past and the future. What a contrast!

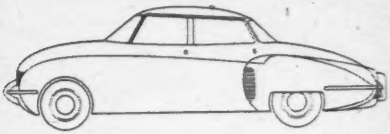
Below, the contrast continued. Roger Oetting and young Exner inspect the top winners' group.

Paris rear-engine model with radiator intakes along the front edges of the rear fenders. Vincent J. Rauth, 19, a farmer boy, won with a two-tone job in light and midnight blue, with plexiglas windows—using chiefly a chisel, wood rasp and sandpaper. Robert J. Hartlieb, Jr., 16, offered a model of balsa wood, machining the wheels out of aluminum. Charles C. Bradley, 14, gave the front of his model a spinner like that on an airplane propeller, for letting air into a duct that carries it back to the rear engine.

The competition is held for boys in the age groups 12 to 15 and 16 to 19. They may submit models either of the automobile of tomorrow or the Napoleonic coach of yesterday. Eight university scholarships and nearly twelve hundred cash awards, to the value of over $75,000, are offered. There is no entrance fee. Each boy who enrolls is given a complete Plan Book with sketches and instructions. Applications may be addressed to the Fisher Body Craftsman's Guild, General Motors Building, Detroit 2, Mich. The 1947 competition closes June 15.

Young Exner displays the car that won for him a $4,000 scholarship to any university of his choosing.

Roger Oetting, 14, proudly poses with the prize-winning Napoleonic coach he built in his spare time.



Above, sketch from which Exner's prize-winning model was made. Below, futuristic car by W. C. Sheldon that won regional honors.

A larger view of Oetting's coach showing the craftsmanship that won him a $5,000 university scholarship.

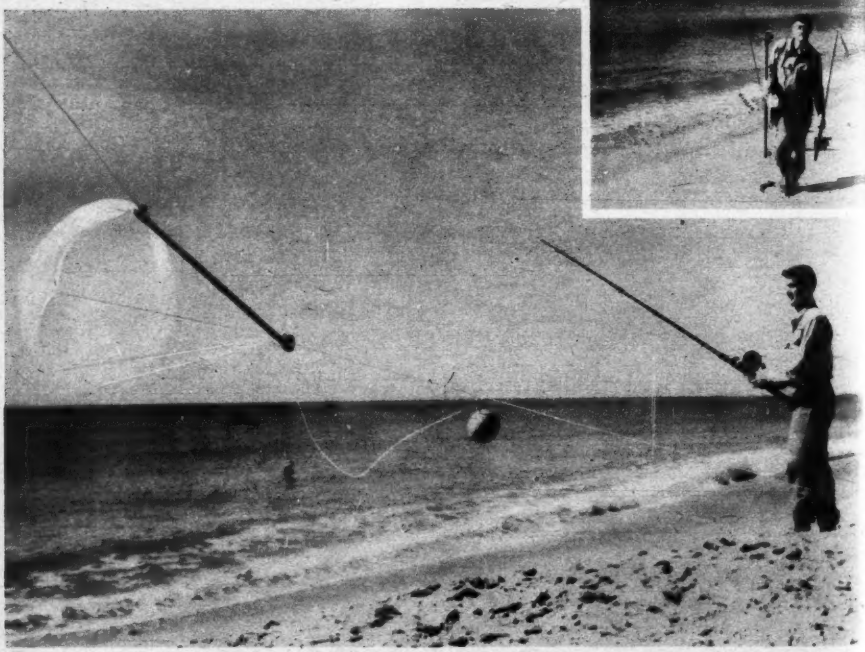
Kytoon for Fishing

THE "Kytoon"—half kite, half balloon—puts the bait 2,000 feet out from shore while ordinary rod casters get only about 80 yards of line out in the surf. Dreamed up and put to work by Domina Jalbert of Cambridge, Mass., the Kytoon is a six-foot-long adaptation of the barrage balloon. He puts the strange device aloft on a light, 3,000-foot cable. When he's reday to cast, Jalbert attaches his line to a small parachute and sends it up the cable on a monorail trolley. A trigger trips the 'chute some 2,000 feet out, emptying the wind and dropping the line. The parachute slides back down the cable.

At left, the inventor displays the results—five large "stripers."

Jalbert arrives at the beach, right, with his rod, reel and Kytoon.

Bait and line ride up on parachute and are dropped 2,000 ft. out.



Many Tricks on the Mini-Tracks

by Banning Repplier

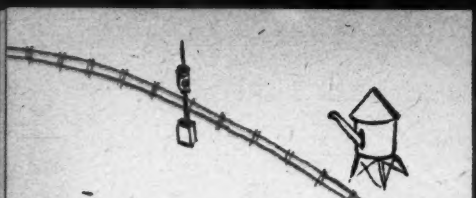
Toy railroads are no longer mere imitations. With the magic of electrons, they surpass the real thing.

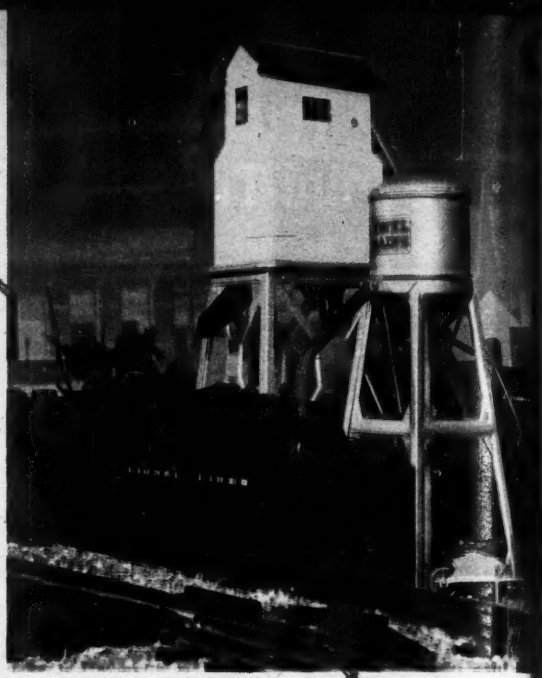
IF LITTLE Willie can get that new train set away from his old man long enough to take a good look at it, he's going to find some pretty startling innovations.

Things have come a long way in the pint-sized railroad field since the Nipponese bombed Pearl Harbor and turned the talents of model trainmakers to more warlike endeavors.

Newest wrinkle is electronic control, researched and developed during the war by the Lionel Corporation, which has been making electric trains since 1905. Regarded by model railroaders, traditionally a volatile lot, as the greatest advancement to human progress since James Watts put a kettle of steam to work, electronic operation will perform miracles designed to dazzle not only Willie but his parents as well.

It was not always so easy. When the Willie of yesteryear wanted to reverse the direction of his locomotive, he had to flip a tiny lever by hand. This, admittedly, didn't contribute greatly to physical fatigue, but it did put a crimp in the illusion necessary to home railroading. And freight cars which emptied their loads automatically were





Locomotive at right takes on coal and water from set's automatic accessories.

as unheard of as scenic trips to Mars.

Then remote control came along. A boon to Willie, it meant that he could back up his locomotive or unload the coal car, but only on a specially-wired track section and only at a preselected spot.

All that's changed now. The push-button age has come to stay on the miniature railroad front. Now the small-fry engineers, and plenty who are not so small-fry, can make their trains perform tricks anywhere on the track layout—through the magic of electrons.

Dozens of feet from the control panel locomotives stop, reverse, go forward again. Whistles blow. A coal car tilts up and discharges its load. The doors on a box car slide open and a cargo of bundles comes tumbling out. And cars uncouple anywhere, even when the train is rocking along at 60 scale miles or better.

All of these wonders are wrought by medium radio frequency waves sent out along the third rail. Each freight car, plus the locomotive and tender, carries a receiver attuned to a certain

Electronic train responds to medium frequency waves sent out from transmitter.

At the touch of a button, Junior loads his gondola car from magnetic crane at left. When the remote-controlled bridge rises, above, train stops automatically.

frequency which makes the cars uncouple or unload.

Operation of the tiny railroad is controlled by the power transformer and the transmitter. The transformer governs the speed of the locomotive while the transmitter, which contains a vacuum tube similar to that in a radio set, makes the train do its stuff.

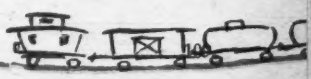
Arrayed in a double row on the transmitter are the push buttons, each molded of a different color and each matching a disc of the same hue on the engine, the tender and the cars. If Willie wants to drop off the caboose he presses the red button. A brown button uncouples the box car. The coal car is cut loose when the yellow button is pressed, and—if the same button is held a moment longer—the car tilts up and its load of realistic-looking coal slides off into a bunker.

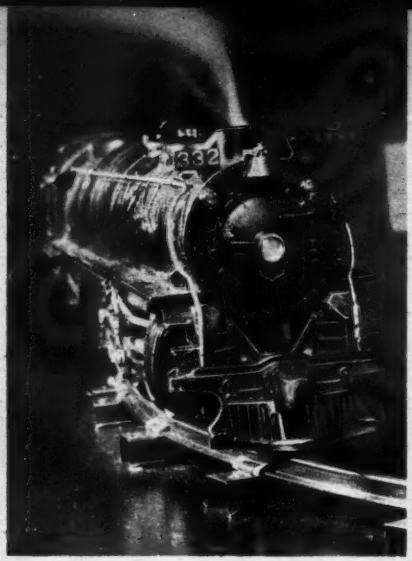
Another button makes the locomotive stop, start and reverse. Still another blows a two-toned whistle concealed in the tender.

Real railroad men look at all this with something approaching awe. They still uncouple their cars the way they did a hundred years ago—by hand.

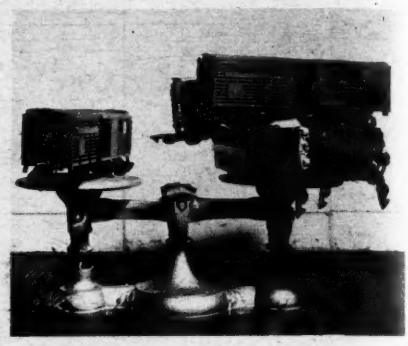
Another 1947 feature the electric train manufacturers are using to widen Willie's eyes is smoke—which billows out of the locomotive in realistic puffs. Released first by

Remote operation sends logs tumbling down chute from lumber bin to the waiting flat car.





Today's engines puff real smoke—with no soot. And with realistic plastic cars—only one-fourth the weight of old cars—locos carry longer trains.



Lionel, which started its engineers and chemists tinkering with the problem ten years ago, the smoke is created by a small pellet which is dropped down the stack, where it is vaporized by a heat lamp. A flutter valve on the underside of the engine admits air, puffing out the smoke to synchronize with the action of the driving rods.

Later, A. C. Gilbert, maker of American Flyer trains, announced a smoke for his locomotives which is created from a liquid. Contained in a capsule inserted in the tender, the solution is vaporized by a process Gilbert feels is too secret to divulge. The smoke is driven by a small pump out of the stack.

Both manufacturers claim their smoke is non-toxic and will not smudge walls or curtains. Lionel smoke is odorless while the American Flyer variety smells faintly of pine. Real railroads please copy.

Even if Willie, in a moment of abandon, should swallow one of the Lionel pellets there'd be no cause for alarm. But the chances are he'd do it only once; the pills, by taste-comparison, make castor oil seem as delectable as an ice cream soda.

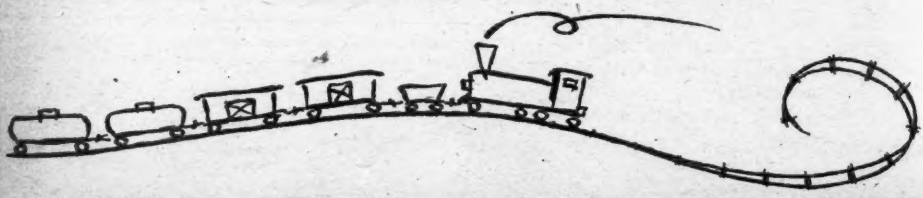
Plastic, which to most people means such things as knife handles and baby rattles, is giving this year's model railroad cars added realism. Although it has the appearance and ring of metal—even the experts have to look closely to tell which is which—the plastic is infinitely lighter, vastly stronger.

Molded in one piece, the plastic cars (polystyrene is most widely used) show amazing detail. Rivet heads, corrugation and door handles have the life-like appearance of real freight cars.

Lionel features a water tower that employs a principle of mystification long known to magicians. When the tender is shunted to a siding to take on water, remote control action automatically lowers the tower spout. The water level in the tank, constructed of translucent lucite, steadily drops, creating the illusion of water filling the tender. Actually, it is pumped to a concealed reservoir in the roof and seeps later into the main tank when the operation is completed.

As the result of four trainless war years, Lionel and A. C. Gilbert, the two largest manufacturers, predict a bonanza market. Millions of American boys have never owned a set; other millions want to add to existing model roads.

And Father, who pays the bills, will probably be first in line.



Canine Cops

The police dog wears a special muzzle while in training. Above right, a regular, eager to be out on the beat. Lawbreakers, beware!

IF YOU were a knowing young dog, a New Yorker, it's very likely you'd want to be a Dog Cop when you grew up.

You'd have to be good. You'd have to pass a stiff one-year course of training in leaping, running and a special canine version of ju jitsu by which you could disarm a lawbreaker, knock him down and told him until your patrolman sidekick came up to take over.

You'd become a regular member of the Force, specially useful for tracking down and apprehending lawbreakers in residential areas.

Not deterred by the gun, Rex holds his man. Boots and Peggy act as a team, holding the "prowler" and forcing him to release his gun.

Playtime SEESAW

Make it fun for your children to "stay in their own back yard".

BY WILLIAM KOERBER

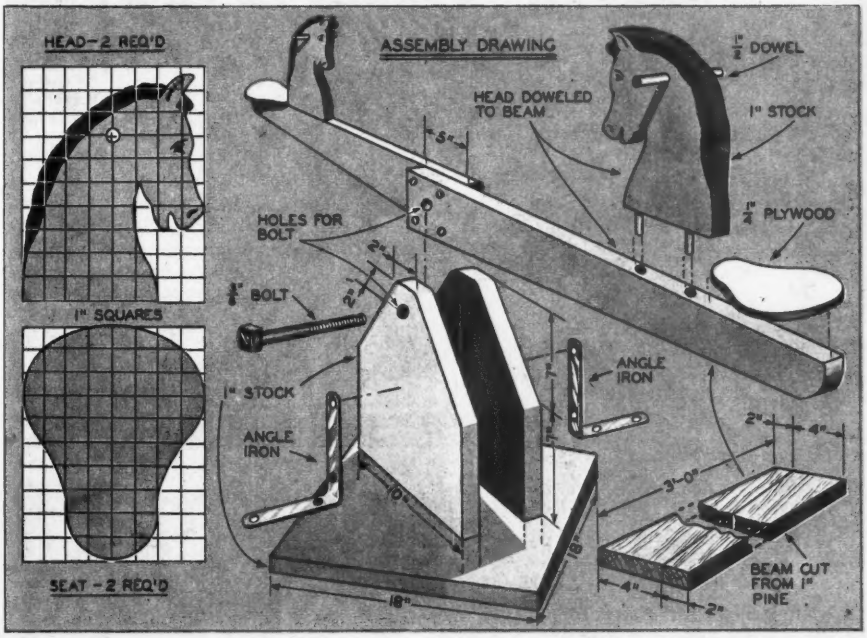
MI Staff Color Photos

THIS seesaw was especially designed for the author's daughter in order to keep her happy in her own back yard. Construction is extremely simple; it should not take more than three evenings' work to complete. The cost of materials totaled about one dollar even with today's high prices.

The beam on which the seats are mounted is cut from a single piece of 1x6 in. pine 3 ft. long as shown. Overlap the pieces about 5 in. and glue and bolt them together securely. The seats are cut from 1/4 in. plywood and the horses' heads from 1 in. stock. Two flathead screws in each seat will hold them securely but the horses' heads should be doweled into the sides of the beam so they won't shake loose. A 3/8 in. dowel also passes through each head to serve as a handle.

The two pieces which form the base support are made of 1 in. stock. They are screwed to the 18x18 in. horizontal platform with flathead wood screws from the bottom. Two angle irons are also used for additional rigidity.

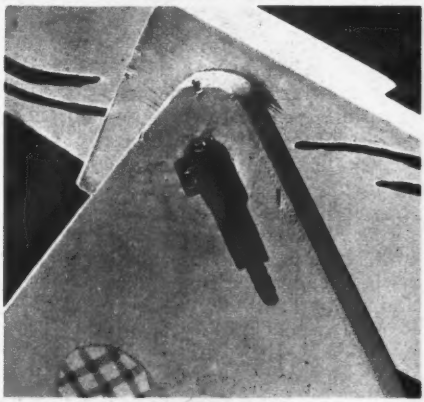
Leave enough space between the up-



rights to clear the beam (which has a double thickness at this part) plus two washers.

Drill a 3/8 in. pivot hole in both the base and the beam and complete the seesaw with a bolt, washers and two nuts so that the uprights can be drawn together and held to the desired spacing. The color photos show the decoration scheme employed. The horses' heads are only a suggestion, any other animals' heads can do just as well.

It really is surprising how much fun a simple toy like this will give not only your child but also the children of the neighborhood. In fact this seesaw has become a sort of nucleus for a neighborhood playground for the assorted small fry within toddling distance of my own backyard. Of course it naturally gives the missus a certain piece of mind to know that sister is within range of her eyes. And if you are interested in child psychology you will be gratified to know that a seesaw is a fine method of teaching your youngster the value of cooperating and the fun in playing with the other children of the neighborhood.

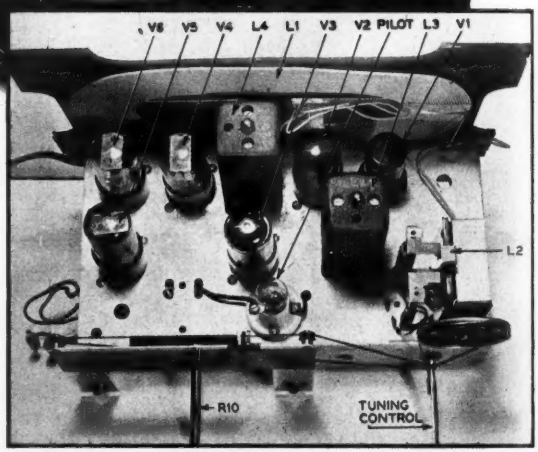


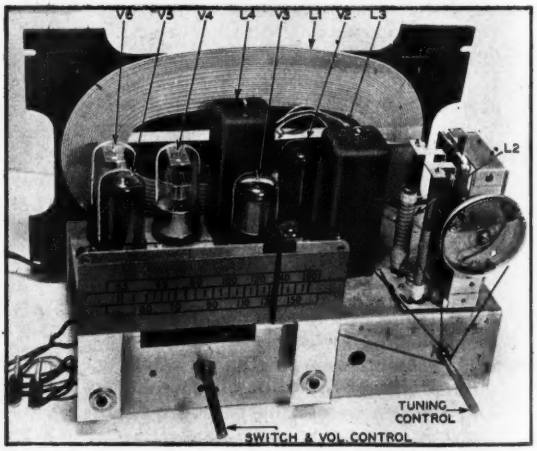
You can store Playtime Seesaw by removing the one large bolt which holds the beam to base.

"Perma-SIX"

BY HARRY HIRSCH
Radio Instructor, Haaren High School, New York, N. Y.

Although home built, the completed set makes an acceptable decoration for the living room.





IN my search for a simplified radio receiver for instructional purposes (and also for entertainment, following the completion of the project!), I became attracted to the new permeability type tuner. This unit consists of two small coils whose electrical value is varied by means of very light iron cores that slide in and out of the coil forms. Small and compact, the unit replaces the usual ganged tuning condenser, antenna coil and oscillator coil of the superheterodyne circuit. It has proved ideally suited for incorporation into sets constructed by radio students and experimenters. The "Perma-Six" shown in the accompanying illustrations is a good example of the application of the device. The receiver is easy to make using standard parts, and its performance will draw favor-

The pictures to the right clearly show the arrangement of the parts on the chassis. Note that the pilot light fits behind the dial and illuminates it when the receiver is turned on.

This high-quality radio receiver uses a new type tuning unit that replaces the conventional variable condensers.

able comment from everyone who hears it.

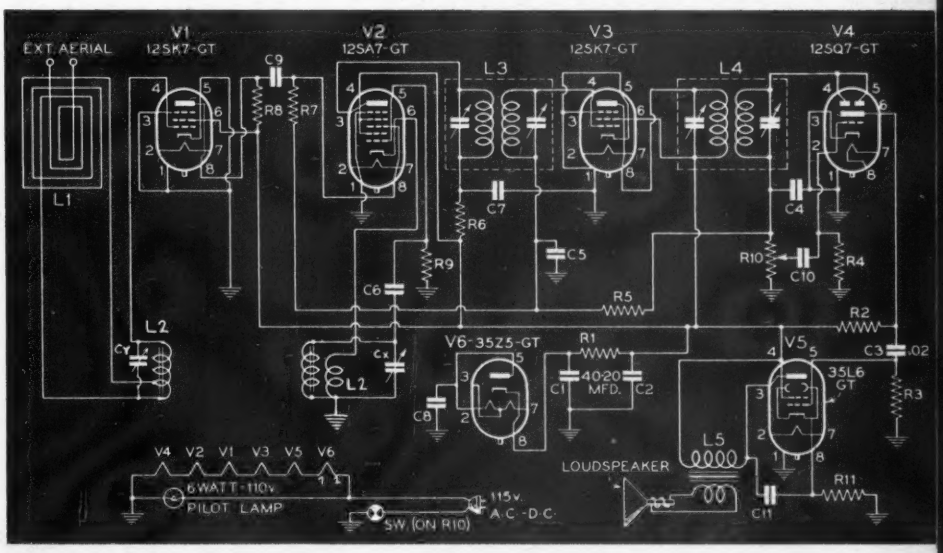
The "Perma-Six" employs six tubes in a reliable, fool-proof circuit. It will operate on 115 volts direct current or 115 volts alternating current, 60 cycles. It uses a self-contained loop aerial, which will give satisfactory pick-up in most parts of the country. Provision is made for the use of an outside aerial, which is recommended for remote suburban or farm areas. This outside aerial need only be a bare copper wire (solid or stranded, the equivalent of No. 14 gauge) about 50 to 100 feet long and as high as possible. The aerial is connected to one of the leads marked "Ext. Aerial" in the diagram on this page, and a "ground" (a wire to a water or steam pipe) is connected to the other lead.

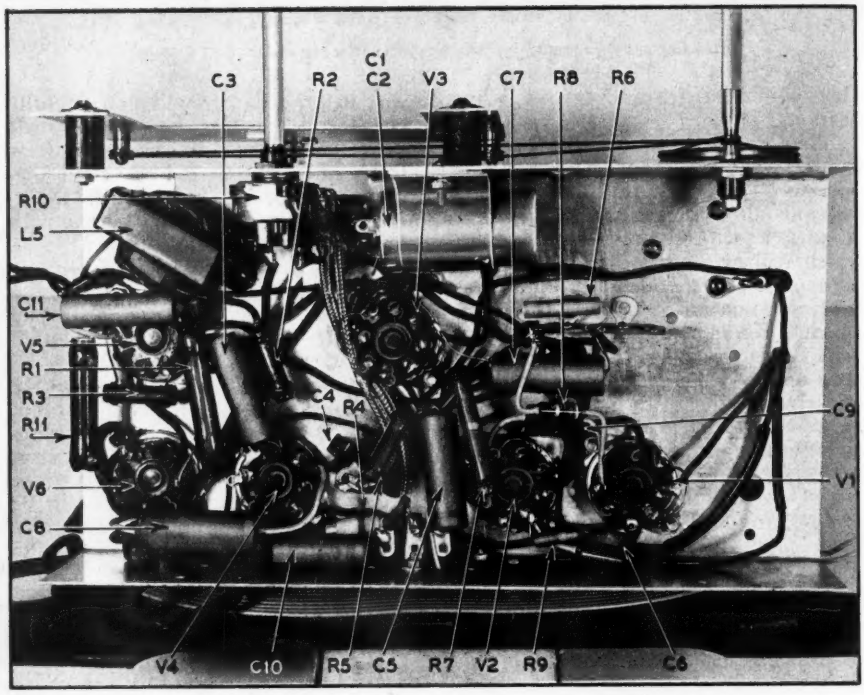
The receiver is built on a standard 10-inch six-tube chassis, obtainable from the mail order radio houses. If you want to drill and bend your own, use 1/16 or 3/32 inch aluminum or iron and follow the details shown on page 117. With a standard chassis, about the only extra holes needed are for the tuning unit and possibly for the dial mechanism. Before making *any* holes, carefully check and measure the various small parts, and make sure you have everything called for in the schematic diagram below and in the parts list. Mounting of practically all parts is done with 6-32 screws and nuts.

The dial mechanism and the tuning unit L2 must be lined up accurately so that the connecting cord will run smoothly. The positions of the other parts are not particularly critical.

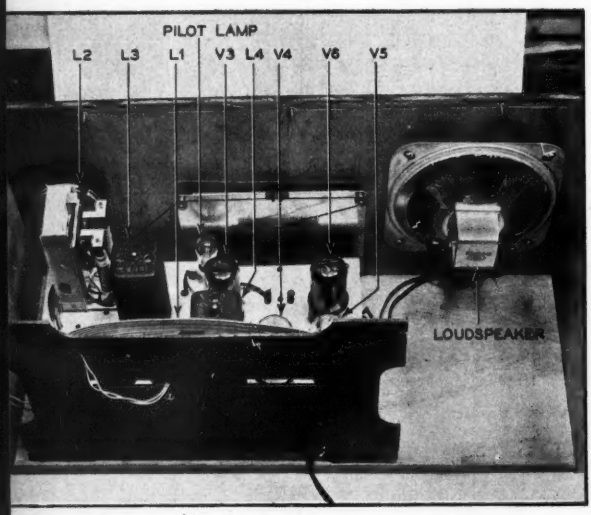
After mounting the major parts (the small resistors and condensers are in most cases supported by their own wires when they are soldered in place), first wire up the heaters of the six tubes. Notice that they are in series, with V4 furthest from the line plug. Also note that one leg of the 115 volt line goes to terminal 2 of the socket for the rectifier tube V6, and that the other leg is grounded to the chassis through the line switch SW, which is part of the volume control R10. Because the chassis is therefore "hot" with respect to the power line (a common condition in A.C.-D.C. sets), don't put it on radiators or other grounded objects in the house. The chassis is enclosed in a

Complete schematic diagram of the "Perma-Six" Check with parts list on page 117.





Above: The underside of the chassis looks crowded, but actually the parts fit over each other in logical order during the wiring process. Most of the resistors and condensers are supported by their own connecting leads. Below: The loud speaker is mounted independently of the chassis. The large cabinet acts as a fine baffle.



wooden cabinet, which is a good insulator, so the likelihood of short-circuits is very remote.

The tuning unit L_2 and the I.F. transformers L_3 and L_4 have color coded leads, the indentities of which are described in the instruction sheets packed with the devices. The tuning unit has built-in trimmer condensers (marked Cx and Cy in the diagram on page 115). These, as well as the trimmer screws of the I.F. transformers, are adjusted in accordance with standard alignment procedure. The intermediate frequency is 465 kilocycles.

After the wiring is finished, and before the chassis and loud speaker are mounted in a cabinet, insert the tubes, connect the line plug and turn on the set by rotating the volume control R10 clockwise.

The pilot light should go on immediately, and the tubes should warm up. Check the rectifier output by connecting a D.C. voltmeter (with a 150 volt scale) between the chassis and the right hand end of resistor R1. If the house current is D.C., a reading will be obtained with the plug in the receptacle only one way. On A.C., the set will work with the plug in either way.

Alignment of the trimmers Cx and Cy and the I.F. transformers is best done by means of a standard signal generator. This is available in schools and at many radio clubs, and is the bread-and-butter instrument of radio service shops. If you finish the set some night at about 11:30 p.m. and are naturally anxious to know if it works, don't touch the I.F. transformers L_3 and L_4 at all, but jiggle the trimmers Cx and Cy while turning the dial. I have found that many I.F. transformers are pretty close to proper adjustment as they come out of the boxes, and that only a little experimenting with the tuning unit trimmers produces results. Once a signal is heard —any signal—you know you are on the right track and you can then try touching up the I.F. transformer screws.

The completed set may be enclosed in a simple home-made wooden cabinet like the ones shown on page 114, or in a ready made one. The bigger the box the better the tone quality.

PARTS LIST

For convenience of identification, the parts are marked in the schematic diagram on page 115 and in the various photographs in accordance with the following list:

Inductors

L1—S-L Hi-Q Loop antenna-inductance 147 microhenrys.
L2—S-L Varie Tuner, permeability type. (Electronic Laboratories, Indianapolis)
L3—I. F. input coil (Meissner #16-8740)
L4—I. F. output coil (Meissner #16-8742)
L5—Loud speaker output transformer (U.T.C. No. R-38A)

Capacitors

C1, C2—40-20 mfd., 200 volt single unit electrolytic.
C3—.02 mfd., 400 volt paper.
C4—250 mmfd., mica.
C5—.05 mfd., 400 volt paper.
C6—50 mmfd., mica.
C7—.05 mfd., 400 volt paper.
C8—.05 mfd., 400 volt paper.
C9—1000 mfd., mica.
C10—.006 mfd., 400 volt paper.
C11—.02 mfd., 400 volt paper.

Resistors

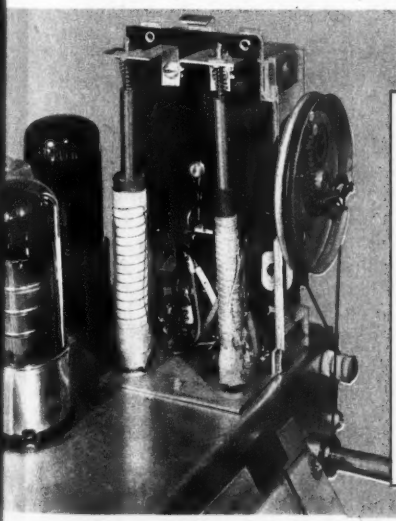
R1—650 ohms, 2 watt.
R2—250,000 ohms, ½ watt.
R3—500,000 ohms, ½ watt.
R4—9 megohms, 1 watt.
R5—1 megohms, ½ watt.
R6—4,000 ohms, 1 watt.
R7—100,000 ohms, 1 watt.
R8—5,000 ohms, 1 watt.
R9—20,000 ohms, 1 watt.
R10—500,000 ohms, variable volume control, with built-in line switch SW.
R11—150 ohms, 2 watt.

Tubes

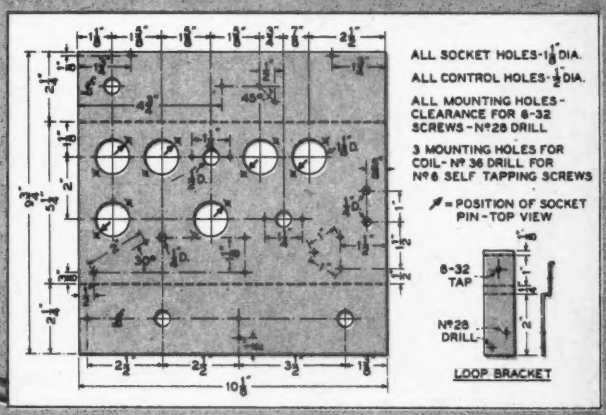
V1—R. F. amplifier 12SK7GT.
V2—Pentagrid converter 12SA7GT.
V3—R. F. amplifier 12SK7GT.
V4—Detector-amplifier 12SQ7GT.
V5—Power amplifier 35L6GT.
V6—Rectifier 35Z5GT.

Miscellaneous

Six (6) Octal wafer sockets.
One (1) Miniature pilot socket.
One (1) 5" permanent magnet loud speaker.
One (1) 6 watt pilot light bulb, 110 volt and porcelain socket.
One (1) Chassis 5¼ x 10⅞ x 2¼ inches.
One (1) Slide rule tuning drive.
Three (3) double tie lugs.
Two (2) knobs.
Cabinet, home made. Dimensions not critical.



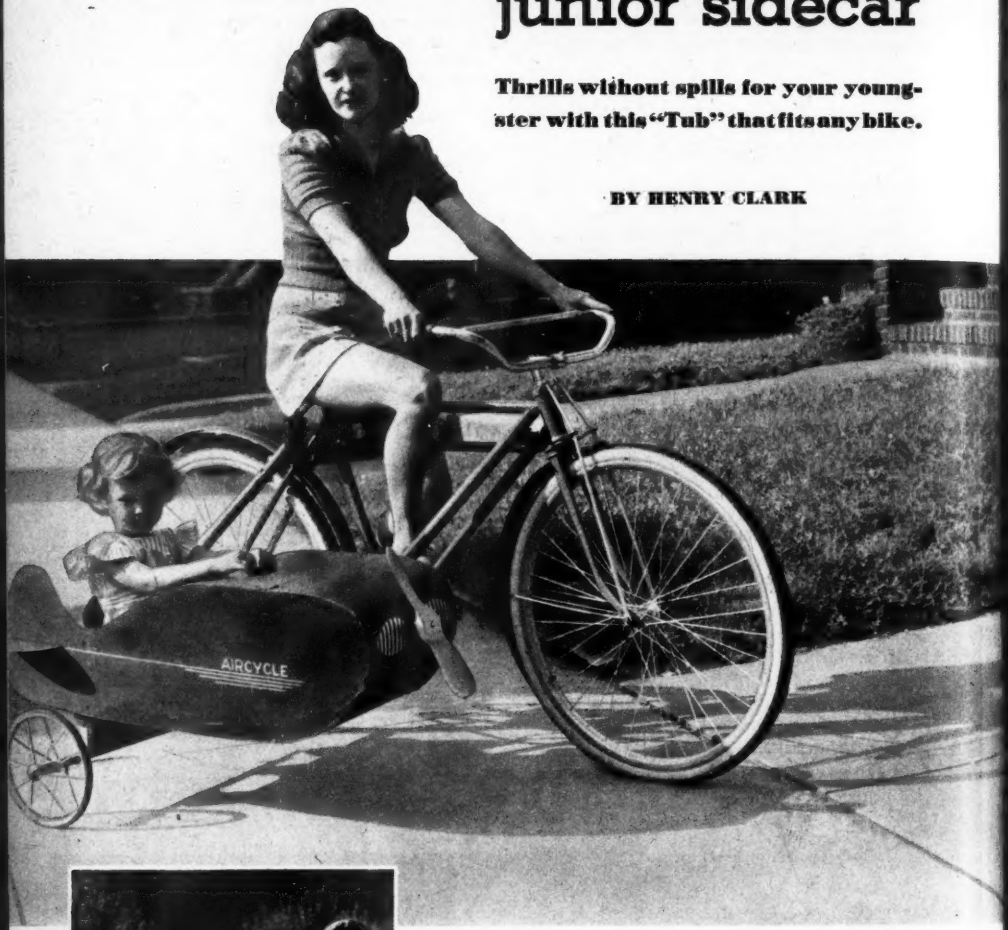
Left: Close-up of the tuning unit. Below: Chassis layout.



junior sidecar

Thrills without spills for your youngster with this "Tub" that fits any bike.

BY HENRY CLARK



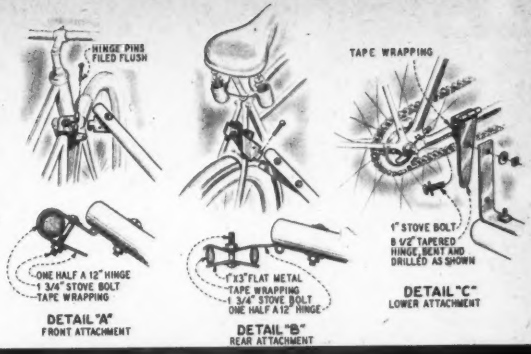
EVER have junior demand a ride on your bike (the one you keep for exercise only) and then when you're wheeling along nicely have him put his feet in the front spokes? If that's been your sad experience, you needn't say no to his "How's about a ride, pop?", the next time he asks. Just gather a few odds and ends of lumber plus some old baby carriage parts and make him (or her) that smooth-looking sidecar the girl's pumping along overhead.

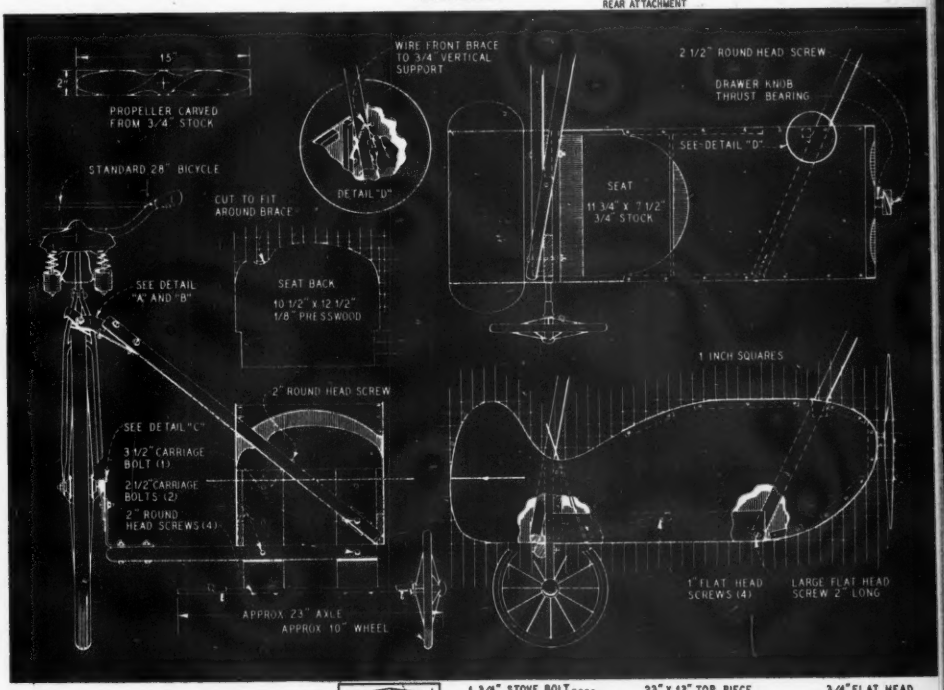
A quick check of the drawings will prove that the construction is an "ABC" affair and also give you all the details of the "bathtub" itself and the bracing that goes to the bike. You can snap this on and off in a flash.

Start the construction with the body, follow-

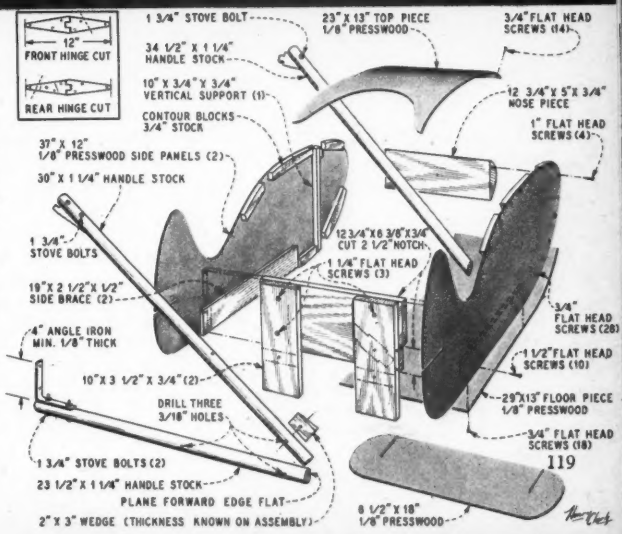
ing the drawings for size and details. When you're bending the Presdwood top and bottom panels and the curve is too sharp, use double-surfaced cardboard instead.

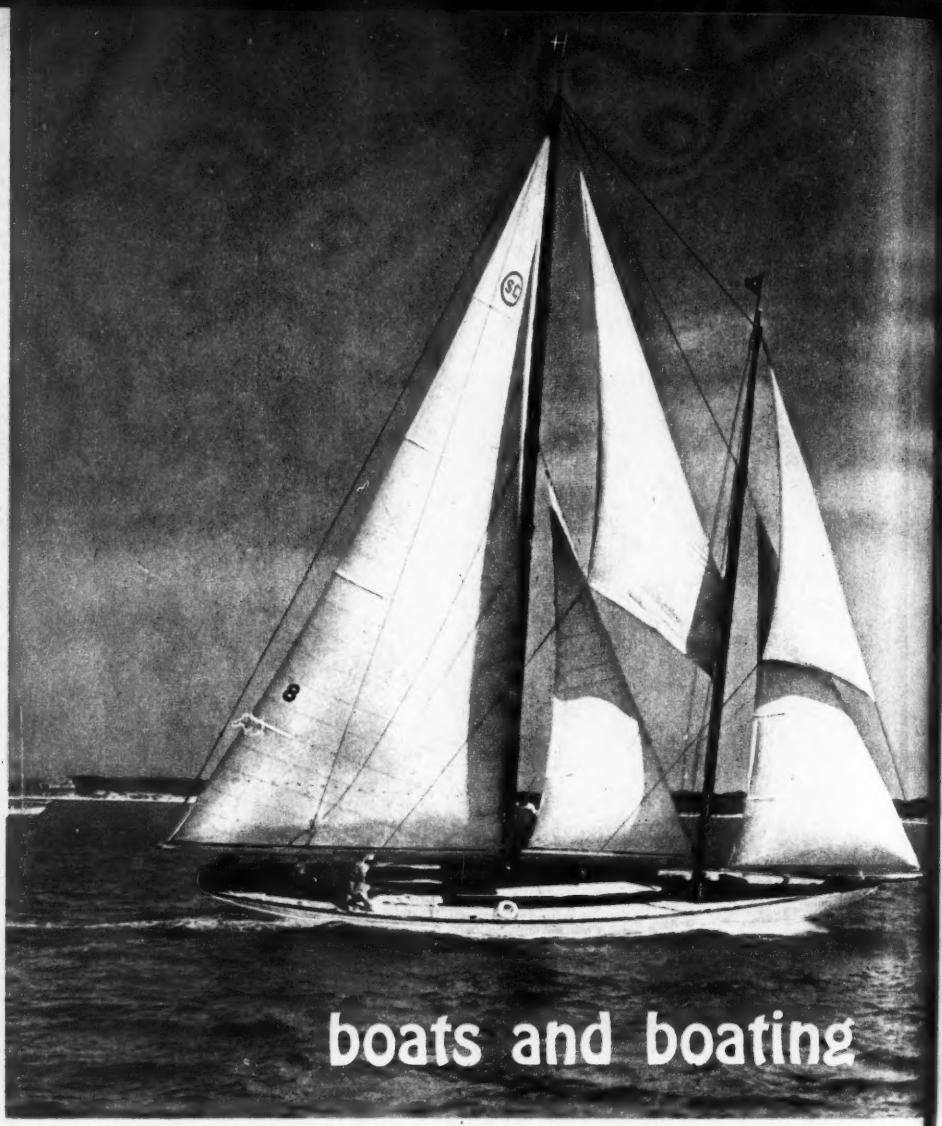
Next, go to work on the three pole braces and the connecting hardware which should be attached exactly as shown to give you knee and pedal clearance. When the lower rear





brace is cut to length, it can be attached without checking its location on the bike. For the others, prop the sidecar (with the wheel in place) on a small box and by trial and error, determine the positions for the other braces. You can also decide on the thickness of the wedge under the rear brace. (The front one will probably come within an inch of the spot shown.) The seat, a windshield and the propeller are then added and the body enameled some bright color.





The right deck crowns help both skippers and scuppers. Here's expert advice on laying these sections out correctly.

BY WILLIAM F. CROSBY

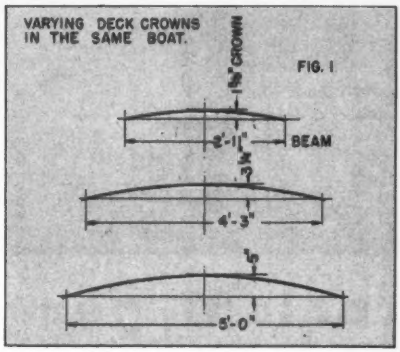
ALMOST all boat decks have a certain amount of curvature or crown which means that the deck is several inches higher at the center than along the edge or sheer. If this distance is too great, the crown may be so high that it makes walking on deck difficult and handling lines or ground tackle, especially in wet weather, a nightmare. One example of this are the high-crowned turtle decks on some modern cruisers that make any work topsides a constant hazard. At the other extreme are the flat decks occasionally found on amateur-built boats where the crown shown on the plans hasn't been followed. With these, the water doesn't run off right and the

Replacing the deck on a Snipe class sailboat. Note how the crown of the beams varies with length of boat.

luckless builder is soon tearing up a rotted deck and replacing it. The correct amount of crown is one that's flat enough to walk on yet sufficiently steep to drain overboard quickly.

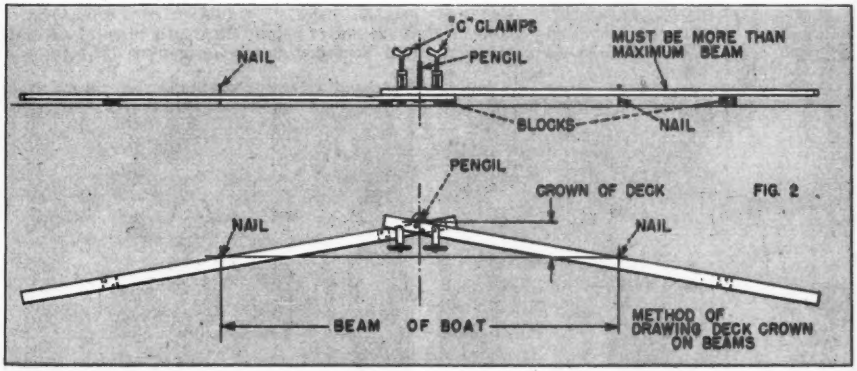
In most cases, the proper crown for a particular boat is shown on the drawings supplied by the designer or publisher and is usually expressed in inches or fractions of an inch for each foot of beam. For example, if the crown is a half inch to the foot, a boat with a beam of 5 ft. would have a deck crown of 2½ in. at the point of maximum beam. For the other points, the crown would vary in proportion to the beam.

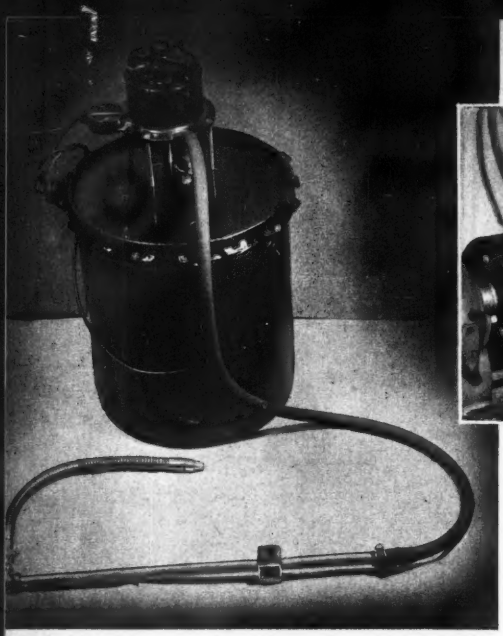
In Figure 1, the crowns for three deck beams of a particular boat are illustrated. The method used to work these out is simple. Referring to the full-size drawing or large-scale plans, the distance from the baseline to the centerline of the deck at each point is measured. The difference between this dimension and the distance from the baseline to the sheer (or deck edge) will give the amount of crown at the particular point. The beam is then drawn, a centerline struck and the height of the crown marked off on it. The same

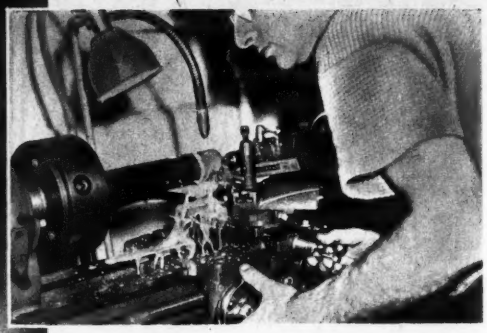


procedure is followed for each deck beam that is required, indicating the amount of crown directly on the material from which it will be cut.

The next step is to draw in the correct curve or crown itself. This may be done in two ways. The first, by carrying the centerline down below the sheer line and drawing in an arc with a string and pencil that will connect the ends of the beam and the mark indicating the top of the crown. The only rub [*Continued on page* 158]







Above: Squirting oil on a piece of stock being turned down on a 10-inch Atlas. Left: The completed unit ready for installation. Pump was designed for lathe use but can be used with any machine.

coolant pump for your lathe

BY AL SPAMPANI

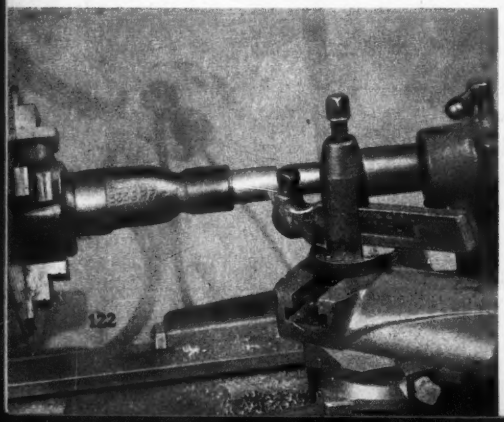
WHEN any great amount of metal turning is done in your shop, the need for a suitable coolant pump becomes more evident. Many times in the past the writer was faced with this problem and finally decided to make a pump that could be easily moved for service with all shop machinery, especially the lathe. After much experimentation this pump was developed.

The pump is about as simple as it possibly could be made. A five gallon paint can was used as a reservoir, a blower motor, an old automobile oil pump, a few pieces of rubber and 1/4 in. diameter pipe constitute the remainder.

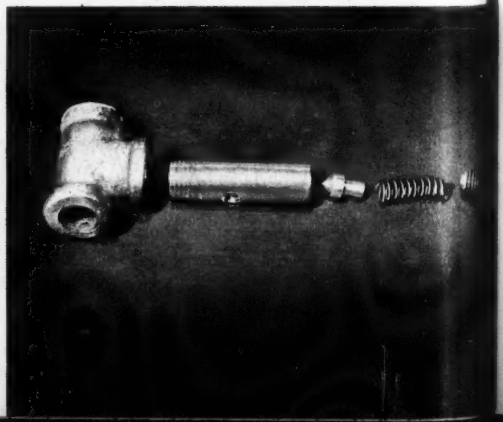
Start work on the oil pump itself. The pump used in the original project was a 1936 Chevrolet pump altered slightly. Such a pump is readily obtainable from any used auto supply shop. Dismantle the pump and clean all parts in gasoline. Knock the pin out of the impeller spout and ream the impeller for the 1/2 in. shaft. Reassemble the impeller and the 1/2 in. shaft after the shaft is drilled for the motor shaft. The casing is now chucked in a 4-jaw and the shoulder turned as shown. Ream the shaft hole to accommodate the new 1/2 in. diameter shaft and reassemble the pump.

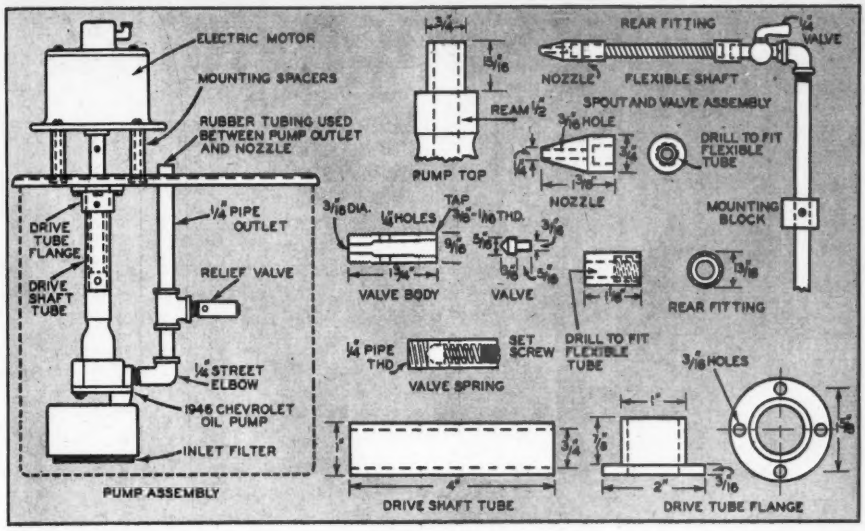
A relief valve is required to relieve the pressure when the nozzle is turned off.

Chucked in a 4-jaw, the automobile oil pump casing is turned down to accommodate the drive shaft.



Relief valve parts. Housing is turned from 1/2 in. dia. brass rod, spring is bent from .018 piano wire.





Machine the valve housing from brass rod. A spring and a setscrew are used to adjust the valve when the pump is in operation. The adapter tube is cut from a piece of 3/4 in. brass pipe. Both ends of this pipe should be faced, then drilled and tapped for 1/4 in. setscrews. Fit the adapter tube to the turned end of the oil pump housing and tighten the setscrew. The other end should fit the flange, which is machined next.

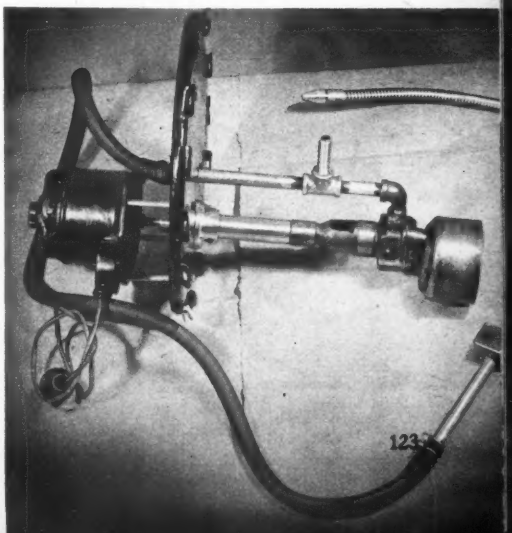
In machining the flange mount the stock in the lathe and bore a hole to fit the adapter tube. Turn the flange as shown and also lay out the mounting hole circle while the stock still is chucked. This is best accomplished with the point of the turning tool. Finally, drill all holes in the top of reservoir cover.

Any motor of about 1/10 h.p. can be used to drive the pump. If the type shown is available, it would be the best bet because of the ease of installation. The motor spacers illustrated are machined from 3/16 in. rod and then cut off.

The spout assembly is made from 1/4 in. pipe. A small valve is used so the oil stream can be easily controlled. A piece of flexible oil can tube is employed so the nozzle can be set in any position.

The pump may be used with any machine providing you have a means of catching the oil which is pumped and returning it to the main reservoir. It was comparatively easy to adapt it to the lathe shown (a 10 in. Atlas) because of the built-in oil pan. However, if your lathe is mounted on a wooden bench, a pan should be made to catch the oil.

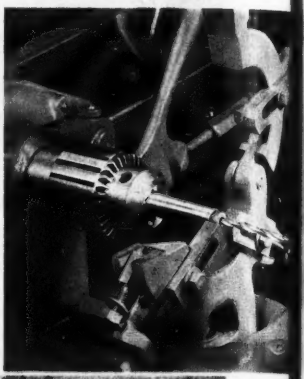
Connect a rubber hose from the discharge line of the pump to the nozzle, using small hose clamps to prevent the joints from leaking. Start your pump and adjust the relief valve so it closes when the upper nozzle valve is open. The relief valve should open when the upper nozzle is closed.



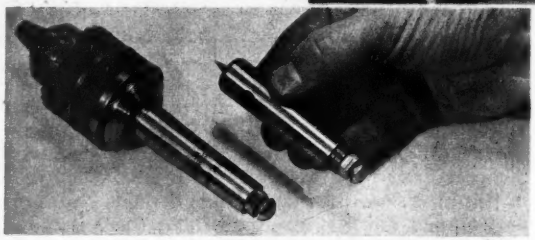
The finished pump without the five gallon paint can reservoir. Unit is easy to make, will serve you well.

shop kinks

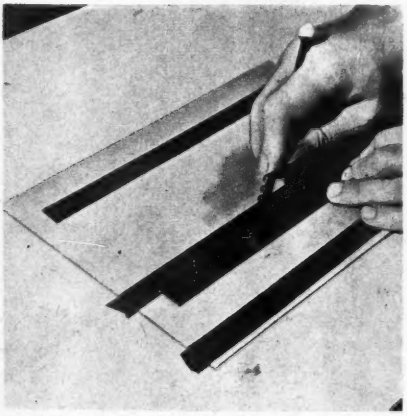
MORSE TAPERS that are a trifle short for the tailstock and therefore hard to remove, can be lengthened quite simply. Merely drill out the end, tap it for a 1/4-20 thread and insert a short, round head screw with a locking nut. The taper is chucked and supported by a center rest as shown in the photo to the right. The lower photo shows a drill arbor and a wood-turning dead center that were lengthened.



SPRAYING SPRINGS and other hard-to-oil places is a lot easier if you save the pump sprayer from a window cleaner bottle and use it on an oil can. Drill a cork and slip it over the sprayer body to replace the regular spout.



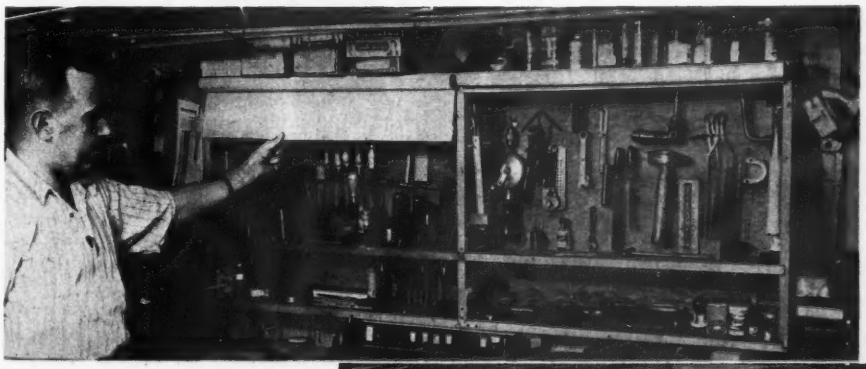
CUTTING GLASS for the novice is a lot easier if strips of friction tape are placed on the board beneath the glass. This prevents the pane from slipping and also cushions it. Holding the cutter between the first and second fingers will also give you a firmer grip.

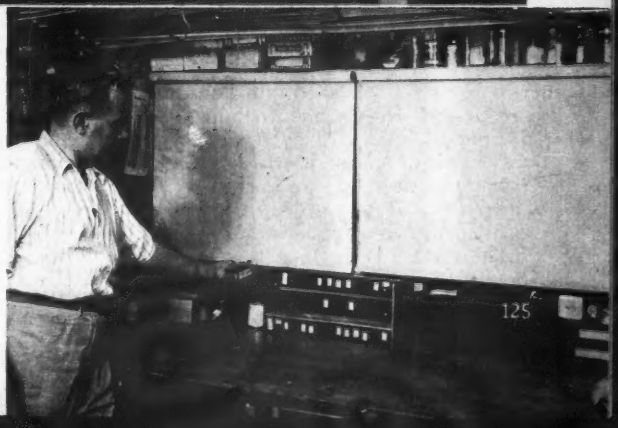


ABOVE: A simple way to get around the difficulty of lining up the mark on a wood piece with the blade of a table saw is shown in the photo. After making certain that the saw is square with the table, place a rule along the blade and scribe a line into the top.

A WANDERING CHUCK WRENCH can be kept in one place by replacing it each time in this convenient holder. It is nothing more than a screw eye with a rubber grommet, of the type used as a guide for the motor switch control rod, mounted on the lathe base as shown.

CASTER SOCKETS on chairs and tables that have become enlarged can be repaired by adding false bottoms to the feet or legs. Use hard wood and attach by means of flat head screws countersunk in the wood. This gives your furniture a new lease on life.

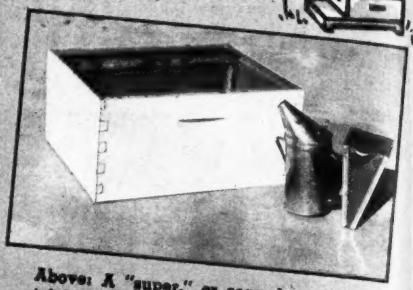




OPEN TOOL CABINETS will be dust free and safe from neighbors "borrowing" hands if a pair of ordinary window shades are installed above the tools. This method is far more convenient than hanging doors on the cabinets and the shades will also pinch hit as a screen for home movies.

produce your own honey

Uncapping a honey comb with a hot knife. More popular method is shown in Fig. 13.



Above: A "super," or second story, containing one frame. Capacity is usually 10 frames. Typical "smoker" is at right. Below: A frame containing a wax foundation.

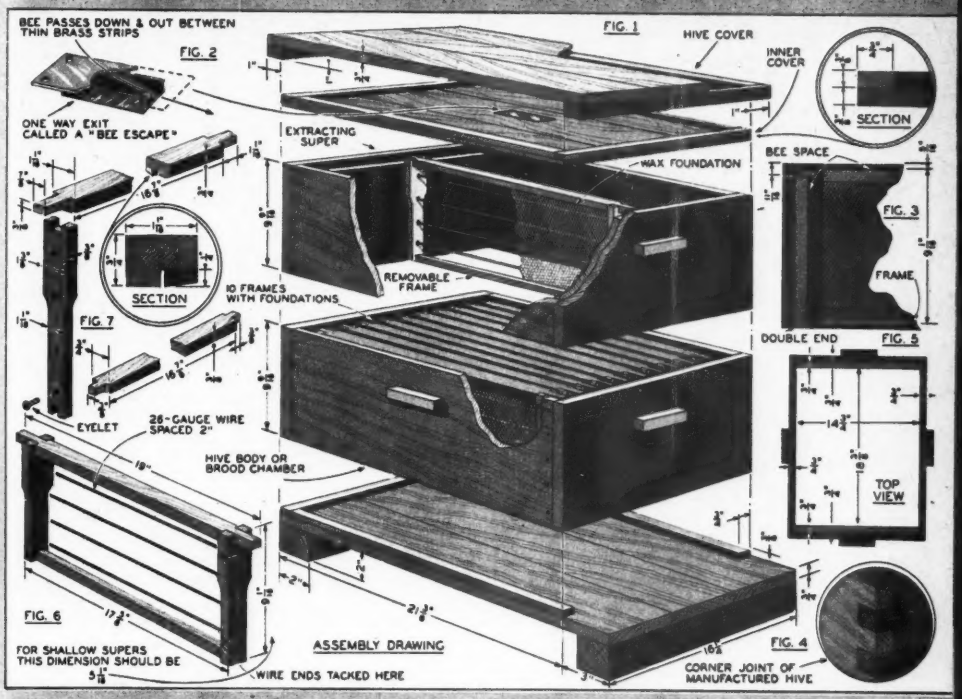
BY HI SIBLEY

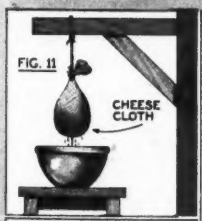
FIFTY to a hundred pounds of honey every year from your own back yard is well worth the comparatively small amount of work involved and since you can make much of the equipment your initial outlay is small. To start you will need a hive consisting of ten removable frames containing foundation wax from which the bees form a comb in which the queen lays eggs and in which food is stored; a super, or second story to the hive, identical with the hive and foundation frames, or a shallower one to hold smaller frames, or boxes to receive comb honey. These two hives rest on a bottom board and are covered with a lid. An inner cover is provided with a "bee escape," a one-way opening through which bees can pass downward but not back up. This inner cover is not used until the super is filled with honey. The super is then lifted up and the inner cover placed below it, so that after the bees pass downward and are unable to return, the super and contents are free of bees when "robbing," or taking out the honey for consumption.

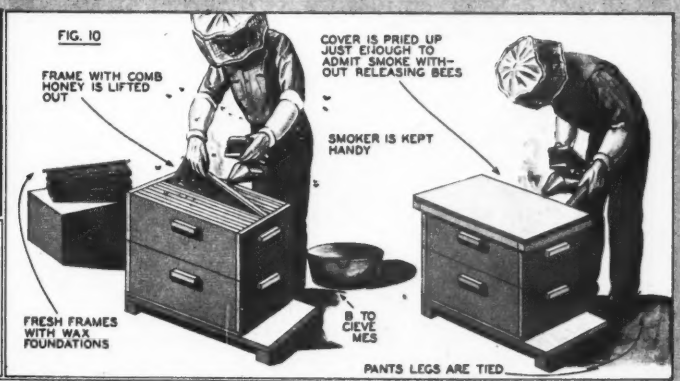
Another device similar to the inner cover is the "queen excluder," a wood and wire grill placed between hive and super to prevent queen from entering the super and laying eggs in the combs. The wires are placed too closely together for the queen to pass through, as she is much larger than the worker bees, but the latter can go and come freely.

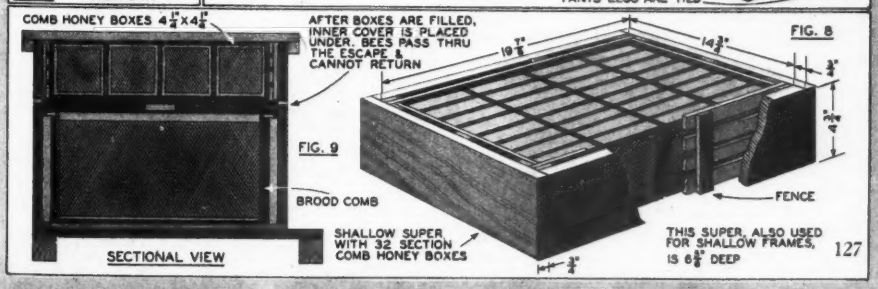
In addition to the foregoing items you will require a bee veil, thick gloves with long sleeves, a "smoker," a hive tool, a syrup feeder, an uncapping knife or two and, of course, the bees. The last are purchased from a supply house, including a queen and, oddly enough, a certificate of health, which is important as these insects are susceptible to certain diseases that would jeopardize your chances of success.

You won't get "stung" raising bees—not when a colony will net you about 100 pounds of honey per season. Here's how you can start this pastime.





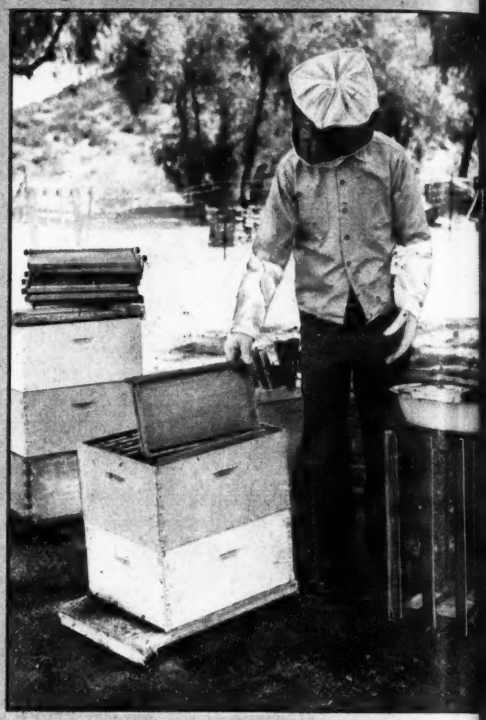




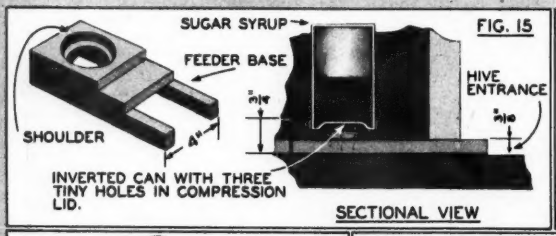
Bees are sold by the pound, and a beginner should buy two, preferably three pounds. They are shipped in screened boxes with a syrup can, and queen in a separate cage hung inside. Price for two pounds is about $4.50, including the queen.

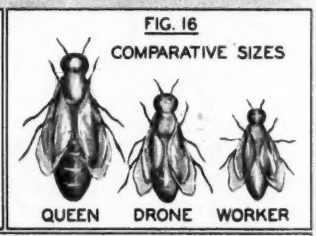
Construction of a unit ready for business is illustrated in Fig. 1. Short lengths of soft pine are generally available, and this is the preferred material, although other wood free from gum may be used. Note that the bottom board has strips of 3/8 in. material around three sides, leaving a front entrance just that high and full width across. The hive is simply a box with top and bottom open and double ends, the inner board serving as a ledge upon which the frames are suspended. Make the super exactly like the hive body, unless you wish to produce box comb-honey, in which case it should be only 4 3/4 in. high, and will be described later.

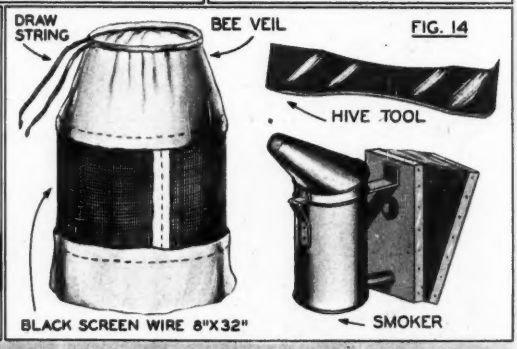
The inner cover is not shown in the position it will be used, as it is not inserted between hive and super until the latter is filled with honey. In the center of this cover is the "bee escape," which consists of a plate with an opening for the bees to pass down



Examine your hive at regular intervals to note honey production. Here a fresh frame is being installed.







Before removing the frames for inspection, a few puffs of smoke will make the job safer.

Removing a full comb of honey from a "super." Bees will become enraged so exercise care.

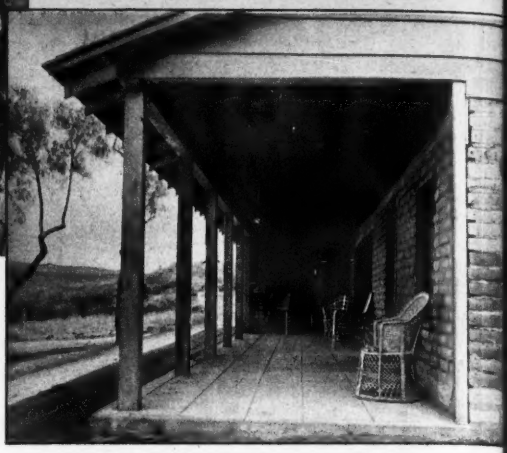
through into a passage-way having an exit at each end. Thin brass strips placed as shown in Fig. 2 allow the bees to crawl into the hive below, but not to return.

The method of supporting the foundation frame is illustrated in Fig. 3, the projecting end resting on the inner end-board of the hive or super, as the case may be. Incidentally, with the manufactured units a joint is made as in Fig. 4, doing away with double ends, but this type of construction is rather laborious for the home workshop.

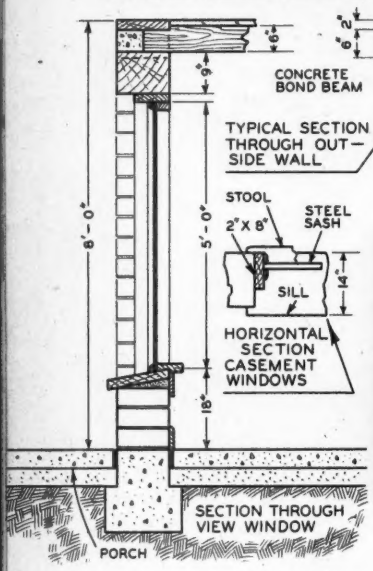
It is important to have the inside dimensions standard, as in Fig. 5, in case eventually you wish to expand your apiary into commercial proportions, and buy equipment in wholesale lots. The outside of the hive or super (never the inside) should be painted white with a lead-free pigment content. Three coats are recommended. The first coat should consist of one gallon of Beehive paint, one pint of boiled linseed oil and one pint of pure turpentine. The second coat should consist of one gallon Beehive paint, one pint of pure turpentine and the third coat should contain one gallon of Beehive paint and one pint pure boiled linseed oil. Spreading capacity is approximately 400 sq. ft. per gallon, two coats. Some apiarists use an aluminum paint (Valdura); in either case the heat-reflecting element is good.

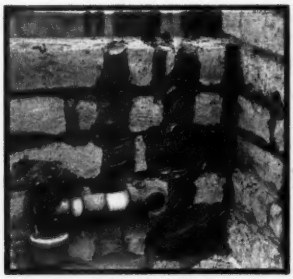
An assembled frame without the wax foundation is shown in Fig. 6. Four strands of 26-gauge wire are strung in one continuous length and ends tacked as indicated. Wax foundations are obtained from a bee supply house and wires are embedded with a spur embedding tool. Commercial apiarists use an electric embedder, which heats the wires just the right temperature without melting the wax. Note that the foundation is installed in the vertical center of the frame, [*Continued on page* 156]

Steel sash casement windows open outwards with all the operating controls inside the screen.



This veranda really invites you to take it easy. It has a concrete floor that measures 9 ft. wide.





Install piping before laying bricks; point up as required.

Mortar between bricks should be smoothed out before it sets.

modern home from mud

The concluding installment describing a "new" material for home-building; the first half appeared in the February issue of MI.

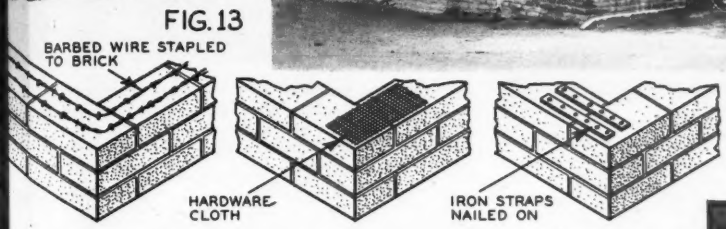
BY HI SIBLEY

LAST month, you remember, we placed the pats in a slow oven and then immersed them in cold water for 24 hours. The proper proportion of stabilizer is indicated by the pat which does not become soft or discolor the water. After the bricks are thoroughly dry, check each for cracking, absorption, strength and erosion under a stream of water from the hose. The pat tests will indicate the action of the corresponding bricks.

Mixing the Soil. Mixing can be done in a scow by hand, Fig. 7. The soil should be thoroughly screened to remove lumps or stones. Hand mixing is satisfactory though laborious, so if you can obtain a power mixer such as a pug mill, discarded dough mixer or plaster mixer you will speed up the job as well as escape a lot of backaches. These mixers are better than concrete mixers as they break up the soil more thoroughly. One ingenious builder rigged up a horse-powered pug mill, Fig 8, with blades on a vertical shaft turning in an upright wooden box. It is loaded at the top and discharged at the bottom. An engine-driven type is shown in Fig. 9.

Brick making can be speeded by pouring in large flats, Fig. 10, and cutting to

View from the southwest corner. Note how irregular spacing of the bricks adds to the charm of the adobe house.

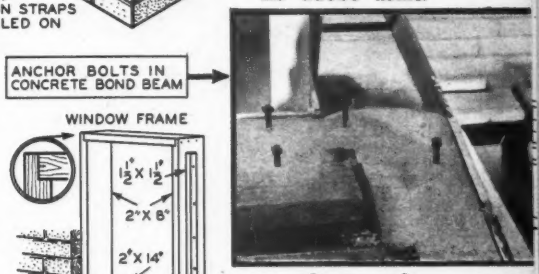


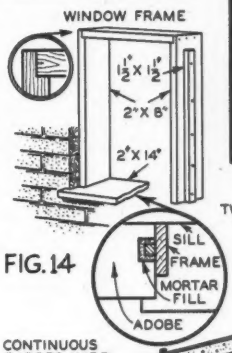
size with a knife and straight edge. If individual or gang molds are used they should be cleaned and doused in water after each operation.

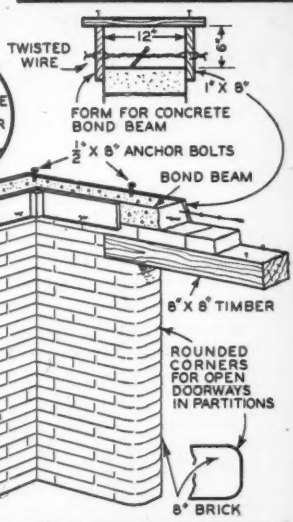
On the second or third day the bricks will be hard enough to stand on edge, to cure for about a week. Then stack as shown in Fig. 11 (never flat on each other) for another week, after which they are ready to lay in the wall.

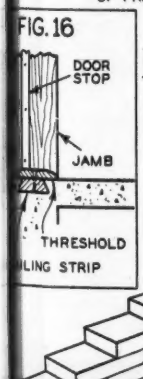
Now that we have taken care of the foundations and the brick making, we are ready for the actual laying of the bricks.

Bricks should be laid with treated cement mortar joints at least ½ in. thick. Use 2½ cu. ft. of sand and 1½ gallons of *Hydropel* to each sack of cement and enough water for mortar consistency. Bricks should be washed to remove dust









The redwood beams of the living room are notched into the heavy timber over the "picture" window. Left: Framing the gable ends. Cement which has dribbled over the bricks is chipped off when dry.

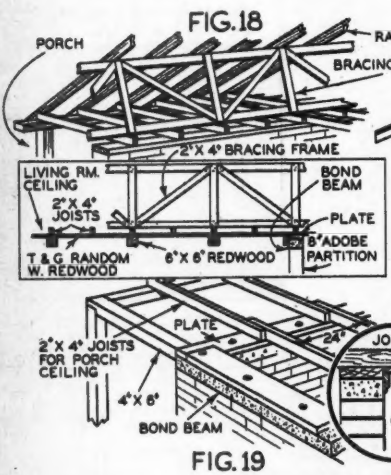
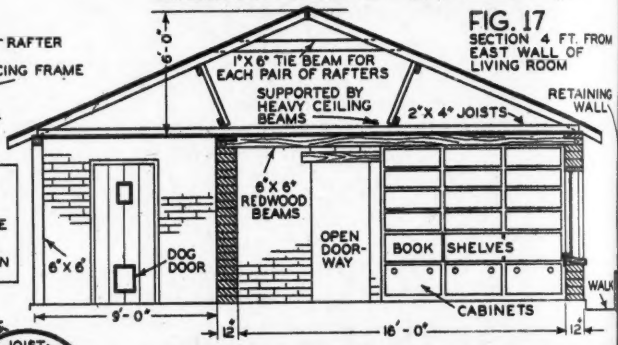
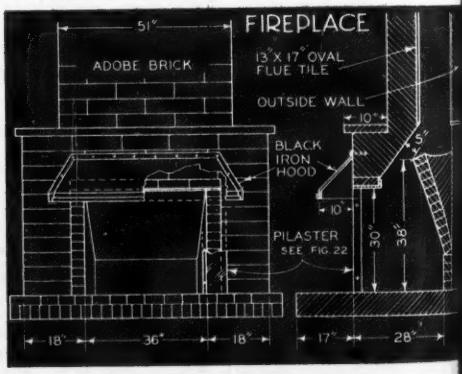


FIG. 19

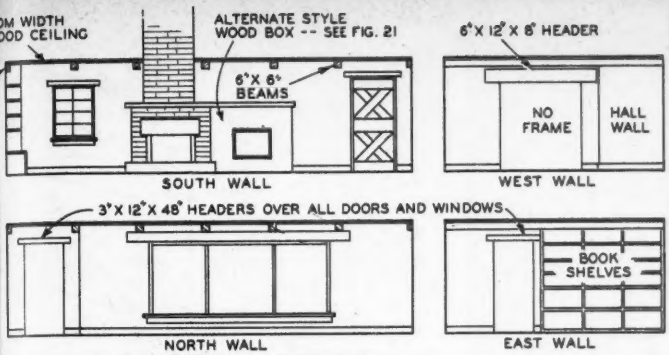




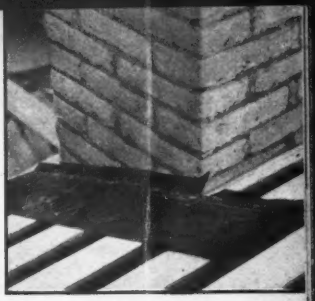
and while still wet should be laid with joints broken between the courses and interlapped at all corners and wall sections. If a baseboard is to be installed, nailing blocks should be inset every two bricks or so. In some cases a brown floor paint is applied about the height of the first course, so that smudges from mop or broom will not show up on the white walls.

You can reinforce the brick by stapling two strands of barbed wire every three courses around the house. Hardward cloth and wide strips of iron were used in the writer's house, Fig. 13.

Window and door frames. Slotted key brick should be laid on each side of the window and door frames, from bottom to top. A batten on the frame sets in the slot and mortar is filled in around to make a complete seal, Fig. 14. The frame and sill are made of 2 in. stock. If 2x14 in. material is unobtainable, the sill may be made of two pieces with the joint coming under the sash or molding. Angle brackets are nailed to the batten and to the key brick to anchor the frame to the wall. Bear in mind that before the brick laying starts on the door frames they should be squared up and braced to re



LIVING ROOM INTERIORS



The installation of the copper flashing around the chimney.

tain them in line; the same is true of the window frames as soon as the wall reaches the sill level. Also, a temporary brace should be placed in the middle as well as the bottom of the door jamb to prevent bowing in, which it most certainly will do if not braced, see Fig 15.

When the walls have reached the level of the top of the frames, install a lintel of reinforced concrete or a 3x12 in. plank. The writer was able to buy some heavy timbers from a hundred-year-old winery which was being dismantled and these came in very handy. Over the 13-foot window in the living room a sixteen foot timber, 12 inches square was used for a lintel. For the open doorways, 8x8 in. timbers were built into the wall. In the case of any such wood members, nails are driven in with heads projecting half an inch to be embedded in the mortar.

To tie the top of the wall securely and form a base for the plate, a concrete bond beam 6 in. deep and the width of the wall was poured and reinforced with steel rods. This is particularly important at

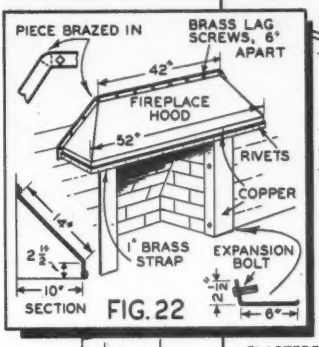


FIG. 22

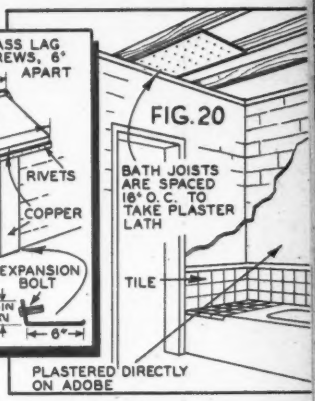


FIG. 20

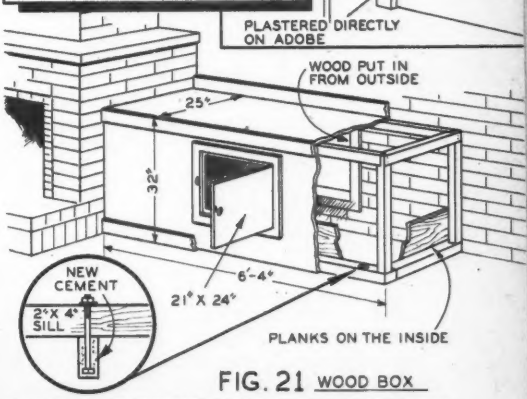
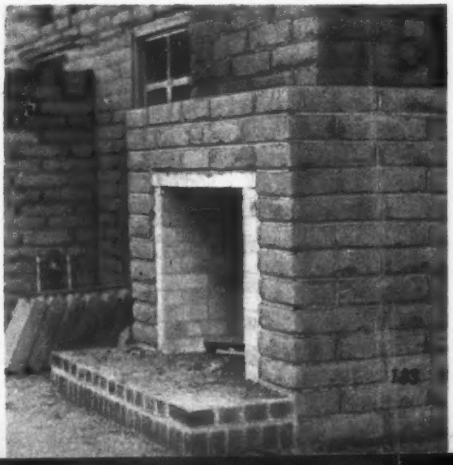
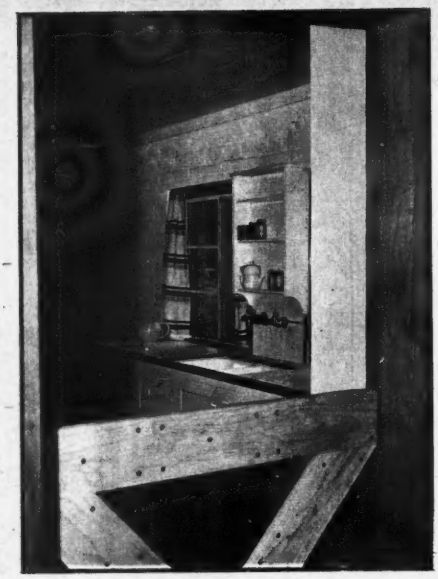


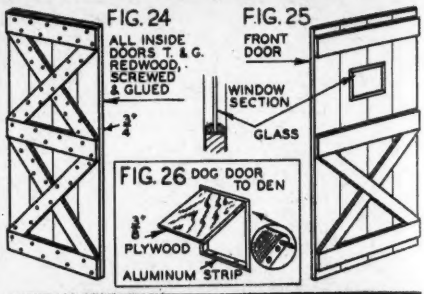
FIG. 21 WOOD BOX

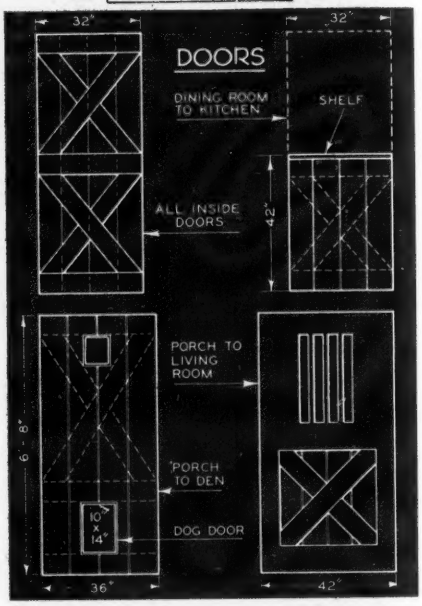


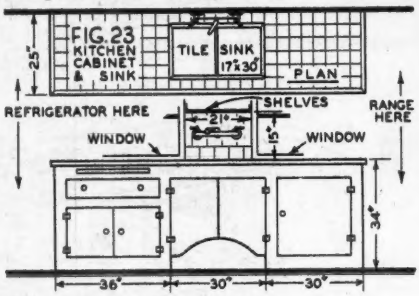
Adobe brick surrounds the firebrick in fireplace. Right: The completed fireplace and the chimney.



The swinging half-door between the kitchen and dining room has oak battens on a redwood frame.







corners, over doors and at windows. Use 1x8 in. boards as forms secured to each side of the wall with twisted wire which will be embedded in the concrete when the ends are cut and forms removed. Anchor bolts are set at all corners and at intervals of four or five feet. To prevent concrete dribbling down between board and wall, place a strip of paper, 2 in. wide, folded to a right angle. Leave the forms in place for several days. Do not expose the concrete to the hot sun or drying winds; cover with burlap or old canvas and sprinkle frequently. Any concrete that has dripped down over the adobe brick can easily be chipped off when dry.

After the mortar in the walls has thoroughly set, the bracing in the window and door frames may be removed and the door sills installed, preferably after the roof is on and all floor work is completed. Fig. 15.

Roof and ceiling construction. On the outside walls 2x12 in. plates are bolted and 2x8 in. plates over the partitions. Ceiling joists and rafters are nailed to these. The sectional view, Fig. 17, illustrates the general construction. In the living room, 6x6 in. solid redwood beams are set into the concrete bond beam at each end and notched so that the plate lies flush with the tops. Over these heavy beams random width T & G redwood is laid, with ceiling joists over them. Joists, 2x4 in., are spaced 24 in. on centers except in the bathroom where they are spaced at 16 in. to [*Continued on page* 160]

KNOW your circuits

THE circuits used for common household electrical appliances are for the most part very simple, and can be mastered with only a little study. A knowledge of them is a big help when the home owner or handy man is called on to shoot trouble in a lamp, toaster, fan or other appliance.

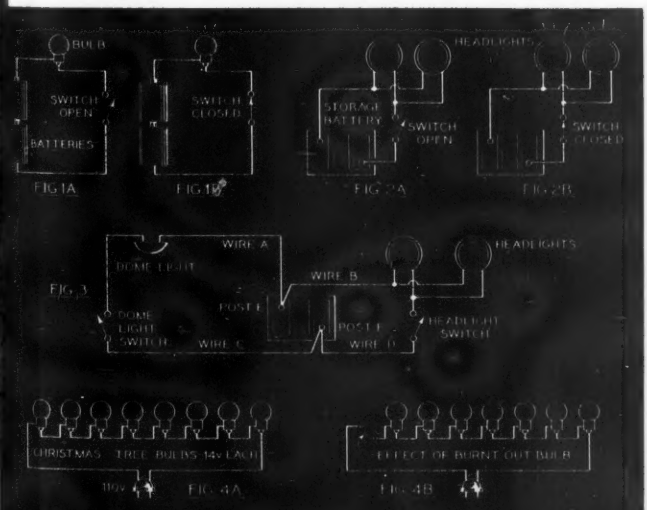
In all electrical practice there are three basic elements: a source of electrical power, the device to be operated by that power, and some means of connecting and disconnecting the two as desired. The last named element is known generally as a "switch," and this word covers a large variety of controls. In its most common form a switch consists merely of a moving metallic arm closing against a fixed contact.

A familiar electrical circuit, that of an ordinary flashlight, is shown in Fig. 1A and 1B. The source of electrical power is a pair of small dry cells or batteries, the device to be operated is a bulb in a reflector, and the controller is the thumb switch. The three elements are connected in "series"; that is, one right after the other. With the switch open, as in Fig. 1A, the circuit is open, the electricity from the source cannot flow to the bulb, and the latter therefore is not lighted. If we close the switch, as in Fig. 1B, there is a continuous circuit from the batteries to the bulb, and the latter lights up. Substitute the house current for the batteries, a ceiling light for the flashlight bulb, and a wall switch for the thumb switch, and you have a room lighting circuit.

One switch can control more than one device at a time. Consider Fig. 2A, which might have been borrowed from your car's service manual. The source of current is the car's storage battery and we have two headlights and a dashboard switch. Note carefully that the corresponding terminals of the headlights are connected together, and this combination is in series with the battery and the switch. The headlights are said to be connected in "shunt," or sometimes the word "parallel" is used to mean the same thing. If the switch is closed, as in Fig. 2B, current from the battery will flow into both bulbs, and they will light up.

There is no limit to the number of lamps or other devices that can be controlled by one switch if they are shunt connected. If one lamp should burn out or be disconnected, the others are not affected in any way.

The same source of current can supply power to many complete circuits, which operate independently of each other. For instance, Fig. 3 shows a dome light circuit in addition to the headlight circuit of Fig. 2. Although wires A and B connect to the [*Continued on page* 160]



P-47 thunderbolt

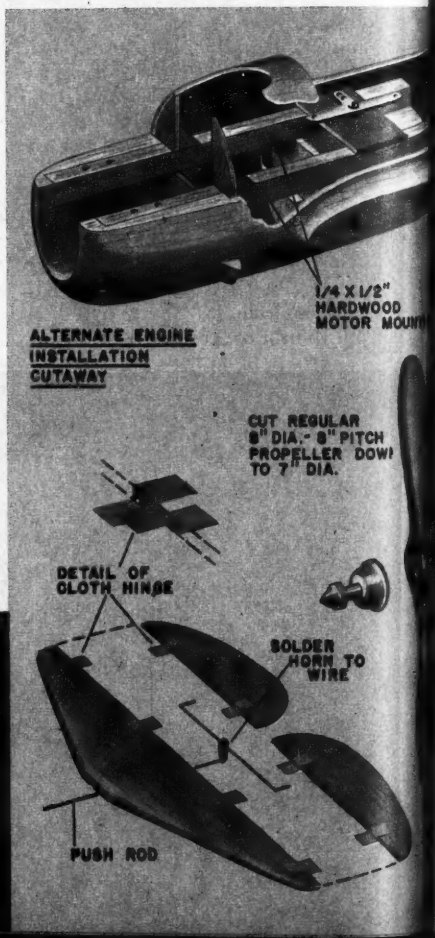
BY ARMAND VASQUEZ

An exact scale 20-inch all-balsa control-line gas model of the famous AAF fighter. An ideal project for the beginner.

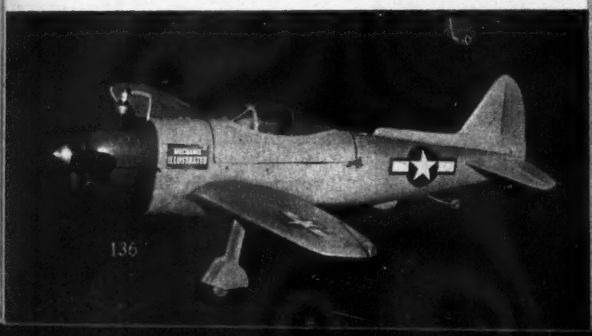
Illustrated by Calhoun Smith

LARGEST and most powerful of the reciprocating engine AAF fighters, the famous Republic Thunderbolt will long be remembered as the number one "pea-shooter" of the war. Although this type aircraft is rapidly giving way to the faster and strategically more effective jet aircraft, the P-47 is still one of the most talked about airplanes of this day and age. As a control-line gas model the P-47 is well suited, with its short nose and large fuselage making engine installation easy. The model presented is an exact scale reproduction, having a wing span of only 20 inches, and is unusual in that the construction is practically solid. All-balsa, it is by far the most simple and definitely more durable than the combination balsa and built-up models. If you can make a solid model—and who can't—you can turn out this realistic model in a few evenings.

The original model was designed and built especially for indoor flying at the MI



After over 35 hours of "logged" flying time, the original job is still flying. Weight is about 14 ounces.

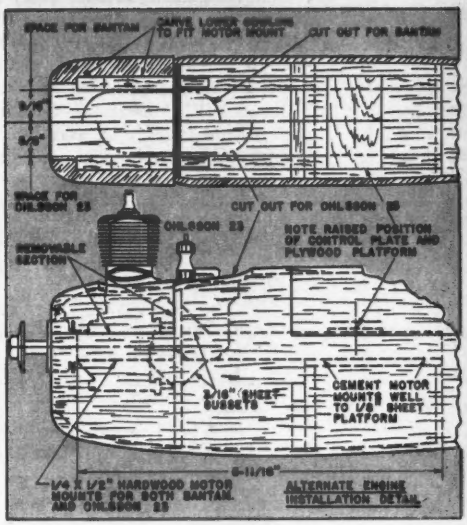


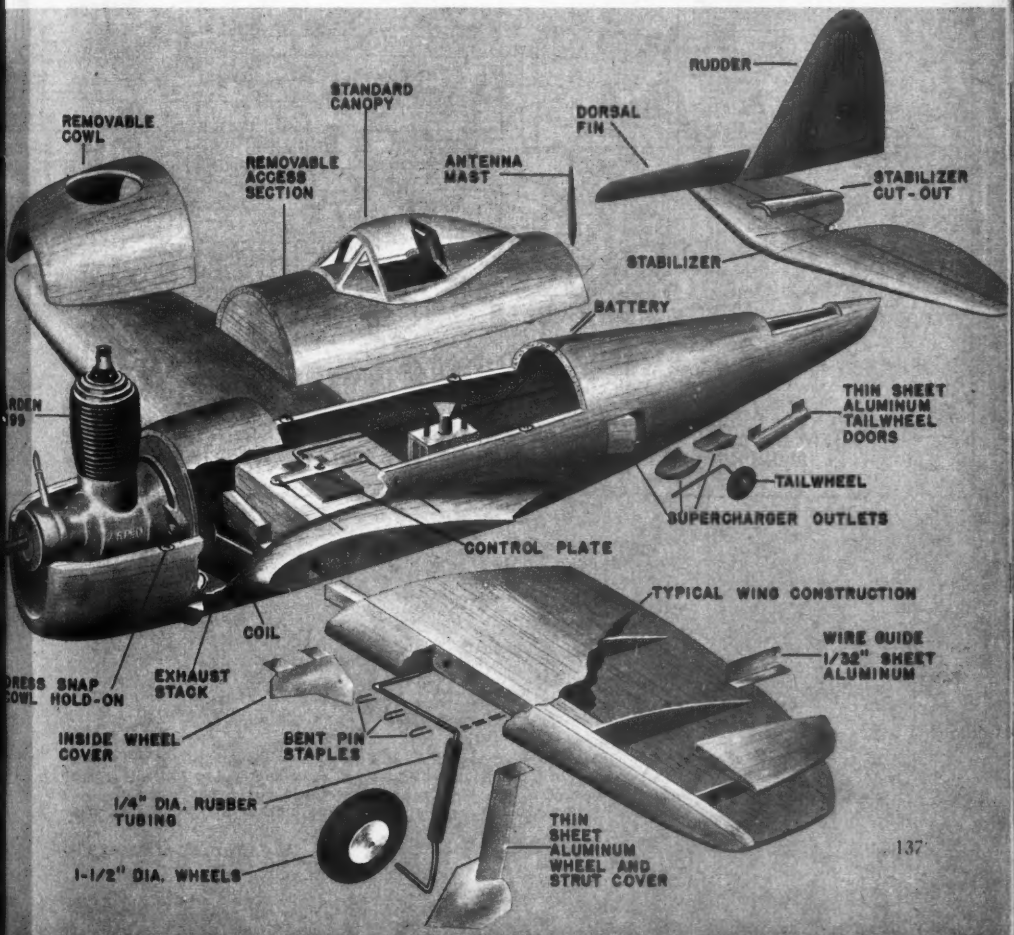
Crafts and Science Show, held in Madison Square Garden the latter part of last November. Flown on 14½ ft. lines, the model not only proved to be exceptionally fast for an .099 powered scale job, but unusually consistent. The P-47 pictured has about 35 hours of "logged" flying time.

The original was powered with the Arden .099 engine but a power plant up to .23 cubic inch displacement can be used. The drawings show the structural changes necessary for installing engines of the beam mount type, specifically the Bantam and Ohlsson 23.

With the exception of the wing, the entire model is made from solid balsa. The wing is covered with sheet to keep the weight down to about 14 ounces, which, surprisingly, was not too heavy for the Arden .099.

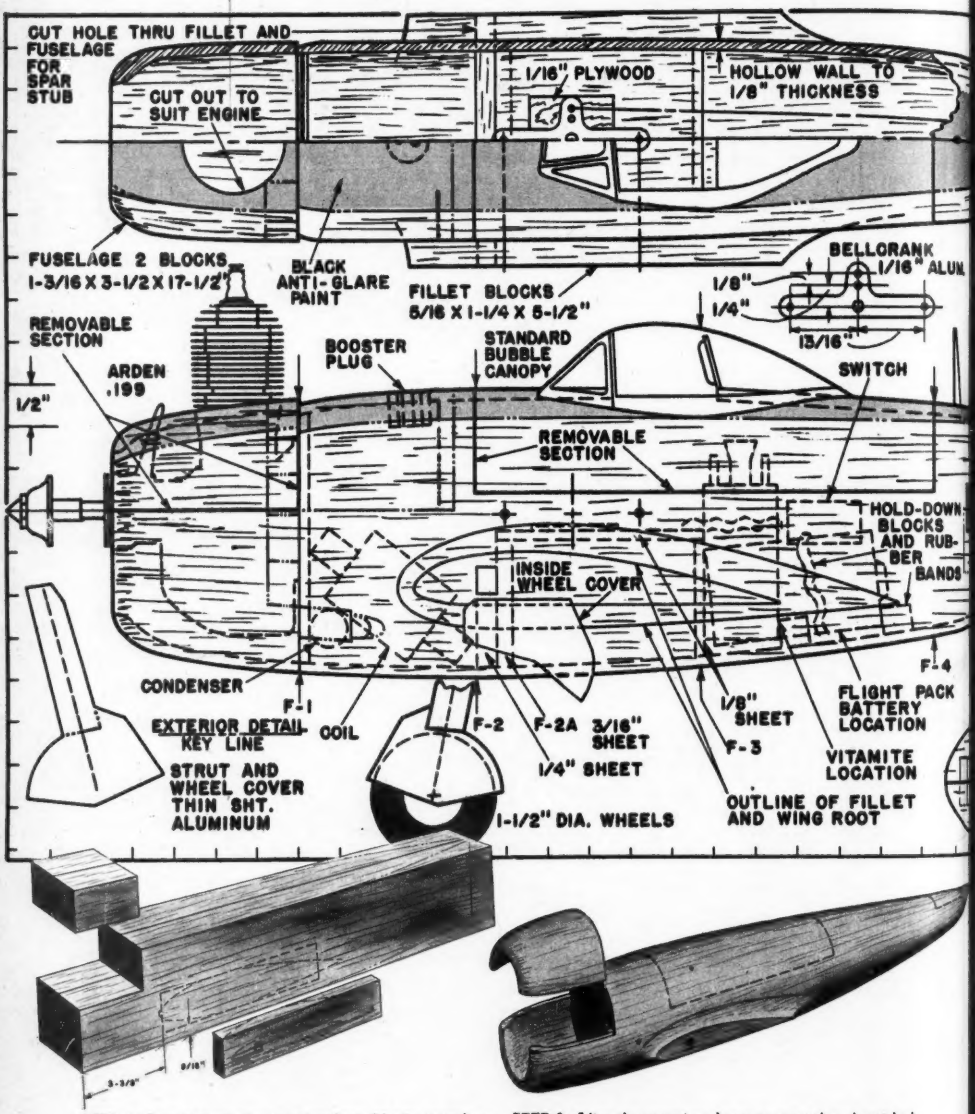
Before starting to build, study the plans carefully to note the construction proce-





dure. Full size plans are necessary to trot down to your hobby dealer who stocks the complete line of MI model plans. If your dealer cannot supply you, send 50 cents to the MI Reader Plan Service, Greenwich, Conn., requesting plan No. 375. Once the actual size drawings are obtained, commence construction with the fuselage.

First obtain two medium grade blocks of the specified size and trace both the fuselage and wing fillet outline on each. Spot cement the blocks together and then add the square fillet block. Next, trace the

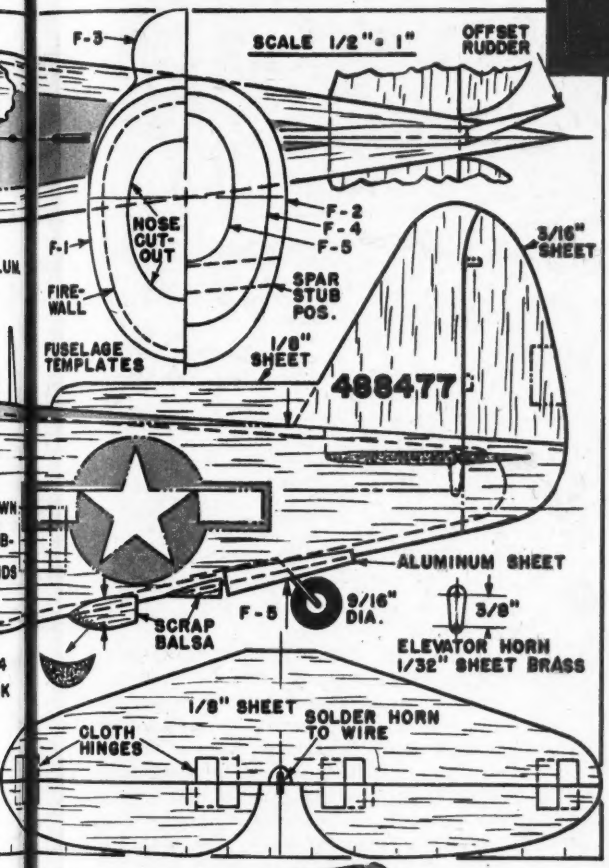


STEP 1: Spot-cement the two fuselage blocks together and then cement the fillet blocks in place. Notch cowl and saw side view outline. Replace the severed pieces and carefully cut top outline. Saw within 1/16 in. of line.

STEP 2: After the exterior shape is carved and sanded, pry both halves apart and hollow out the interior. Cut away upper cowl and ignition hatch and then cement the fuselage bulkheads F-1 to F-3 in place.

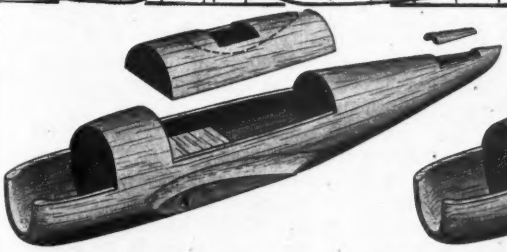
top view on the block and carefully saw along the side view line with a jig, band or coping saw. Replace the pieces and proceed to cut the top view outline. Finally, notch the upper part of the nose and spot cement the cut-out piece to the block after the edges have been made smooth.

Model is an exact scale reproduction even to the wing fillet and scale landing gear.



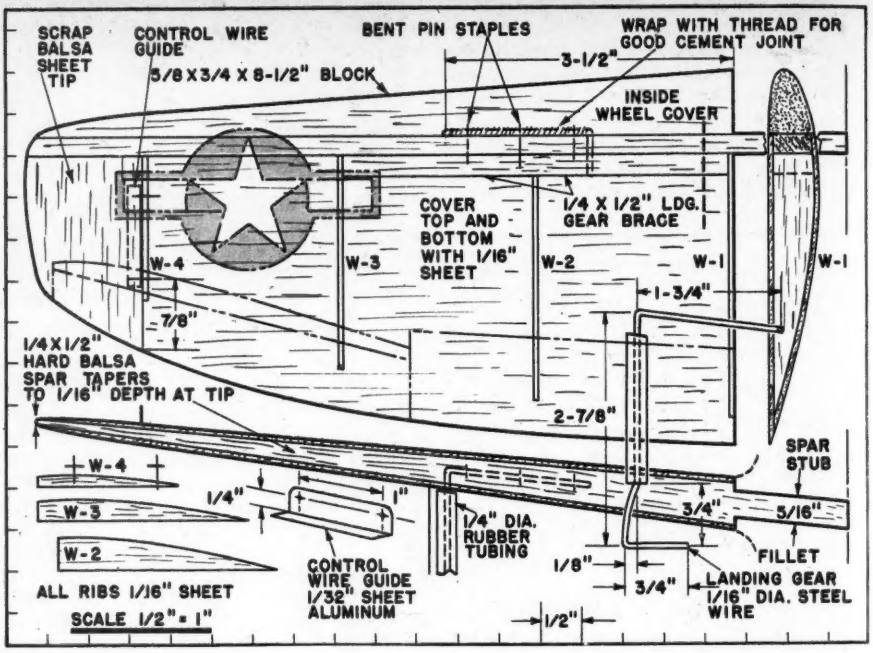
Now proceed to carve the fuselage to shape. If you have built a solid model in the past the carving should be comparatively simple. If not, cut templates from the fuselage cross section outlines and check the various stations as you go along. Note that the wing fillet is carved into the fuselage. Take extreme care when carving this area, else the incidence angle of the wing will be changed. If you trace the fillet outline on the fuselage you just can't go wrong.

With the exterior shaped, sand first with No. 1/2 paper and finally with No. 00. Pry loose the halves and carve out the inside, using a gouge or similar tool. Hollow out to an average wall thickness of 1/8 in., sandpapering the inside smooth. A piece of sandpaper wrapped around a regular dope bottle of about 1 in. diameter will produce a nice job. With the interior hollow, cut away the upper

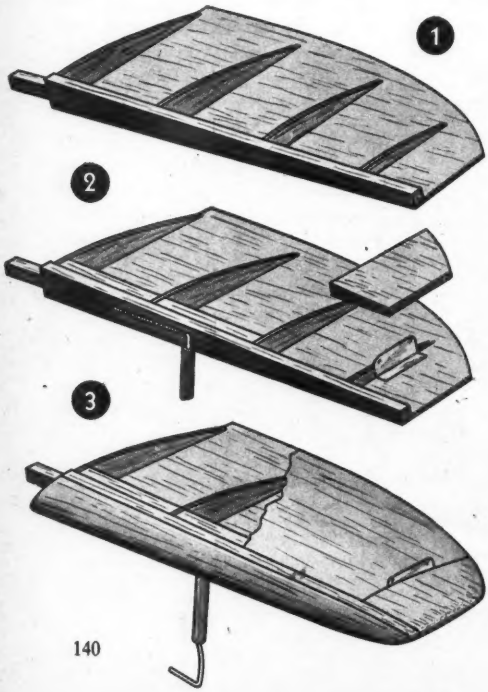


STEP 3: Install the control platform, add 1/8 in. sheet bulkheads to the edges of the removable ignition hatch and then mark outline for the bubble canopy. Finally, install control plate and cut fuselage for stabilizer.

STEP 4: Cement the stabilizer to the fuselage and then hook up the control system. Add the vertical tail surface, checking to see that it is perpendicular with the stabilizer. Attach wing and finish as stated in the text.



STEP 1: Cut out the wing bottom up to the spar and tack to a board. Add spar and ribs. 2. Anchor landing gear wire, add tip block and line guide to left panel. 3. Cover upper surface with 1 16 in. sheet and attach solid leading edge. Carve and sandpaper to final shape



cowl section and ignition hatch and then cement the firewall (F-1) and bulkheads F-2, F-2a and F-3 in place. If you are using either the Arden .099 or the .199 power plant drill the two holes for the mounting bolts. If you are installing any of the beam mount engines, install regular bearers, as shown.

Install the ignition equipment, using the hook-up supplied by the manufacturer of your engine but retaining the position of the booster plugs and switch as shown on the plan side view. The control plate, or bellcrank, is next cut from sheet aluminum and mounted on a $\frac{1}{16}$ in. (or $\frac{1}{8}$ in. if you are using an engine over .19 displacement) plywood base, which in turn is cemented to the sheet covering over bulkheads F-2a and F-3. The plate pivots on a 6-32 bolt, with a washer between the plate and the mount to insure smooth operation.

The tail surfaces are next. Trace the outlines on the prescribed sheet balsa and finish each surface so a streamlined or symmetrical airfoil exists. Cut the elevators and rudder away and then add the elevator hinges. [*Continued on page* 160]

FULL SIZE PLANS —See Inside Front Cover

Build with MI PLANS

BONNIE, 18' V-bottom auxiliary sloop. Plywood construction, seaworthy. No. 944, $3.00, (with full-sized patterns, $7.00).

MALLARD, 14' plywood hunting or fishing boat. Optional rowing or outboard hulls. No. B-143, $1.00.

TESTED BOATS

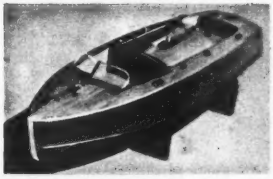
Scale Blueprints

SCRAM III, 16' inboard designed to take a model B Ford marine conversion engine. Simple plywood construction throughout. No. 936, $1.50.

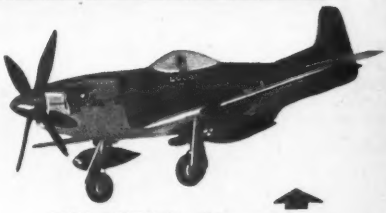
FLYER, 12' outboard utility. Uses 1 to 10 h.p. engine, speeds up to 20 mph. No. B-142, $2.00.

TESTED MODELS

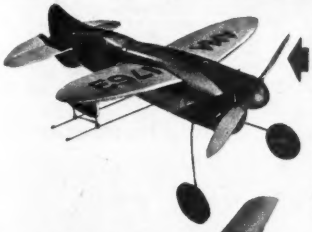
Full Size Plans



BOUNCIE, 32-in. speedboat. Easy to build, takes any engine. Plans also contain instructions. No. 362, 50c.



P-51H MUSTANG, 32-in. control-line job features removable landing gear, take-off dolly. Realistic, easy to build and fly. Plans, Instructions, No. 364, 50c.

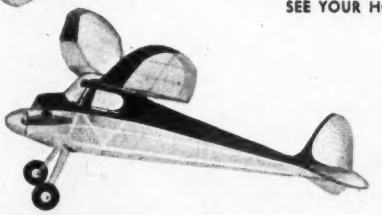


DOODLEBUG, 95 mph 16-in. control-line speedster-trainer ideal for either beginner or expert. Takes any A or B engine. All around performance. Plans contain instructions. No. 365, 50c.

SKYSEDAN, 36-in. super-scale control-line model of the new Piper private plane. Power with any class engine. Plans contain instructions. No. 370, 50c. SEE YOUR HOBBY SHOP FIRST!

NAVION, 36-in. scale control-line model of North American's new lightplane. Tricycle gear prevents broken propellers. Simple construction. Plans contain instructions. No. 369, 50c.

PYLON BUSTER, 82-in. free-flight Class C contest winner featuring a most unusual aerodynamic force arrangement and an automatic glide control mechanism. Plans contain instructions, No. 378, 50c. SEE YOUR HOBBY SHOP FIRST!



SNOOTIE, 40-in. Class A free-flight contest job designed for the Arden .099 power plant. Complete plans and instructions. No. 370, 50c.

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3-47

The plans listed on this page are only a few of the many MI publishes. Send a 3c stamp for the new 100 project MI PLAN BOOKLET.

car care

WHEN you do a ring job on the motor, make sure that the new rings are not cramped in their grooves. If they fit too tightly they will not be able to expand radially, thus causing the engine to pump oil and lose power. Ring grooves should be not less than .001 in. to .0015 in. more than ring width except in the case of the top compression ring for which the measurements should be .0015 in. to .002 in. If rings are too thick they can be "cut" by rubbing the flat side over a piece of emery cloth tacked to a flat surface.

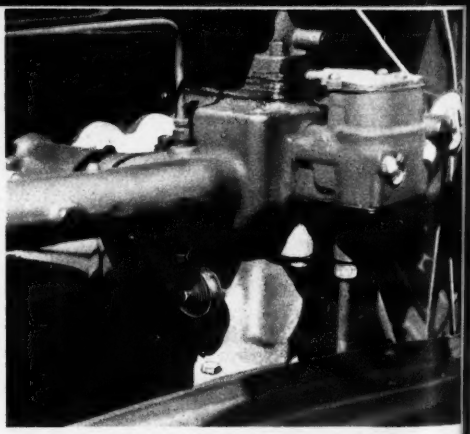
HARD CRANKING with a warm engine, following a motor overhaul, would seem to suggest a weak battery but it usually means that the rings have expanded against the cylinder walls. If the engine cranks easily when the motor has cooled, you will know that the battery and the starting motor are not to blame.

CLUTCH GRAB? And chatter? Even after a new pressure plate has been installed? Service men are finding this may be due to failure to remove anti-rust compound from the plates.

OIL BATH FILTERS are often accidentally filled with water while washing the car or filling the radiator. This causes an air drag and will up your gas consumption. Check the oil level in the filter and make sure there is no water in it.

Front wheel shake will indicate worn king pin bushings provided the wheels are not loose on their spindles. Many owners are misled by failing to consider possible slack in the bearings.

Poor gas mileage and a general sluggishness may sometimes be due to a stuck heat control valve in the exhaust manifold. When this happens incoming gas mixture is not being preheated enough.



BEHIND THE WHEEL

with Fred Russell

If you want a personal reply from Mr. Russell please include a self-addressed stamped envelope.

What causes water to condense on the dipstick of my 1937 Ford? C. Lamont, Brantford, Ont., Can.

Such condensation is normal, although it would be well to check any tendency of the engine to overheat; an internal gasket water leak sometimes causes this trouble.

How can I prevent the wheels of my 1936 Chevrolet from being stolen? P. Graham, Woodside, N. Y.

You can get a set of wheel-locking devices from any large auto accessory store.

What causes my Buick to shimmy at 45 and 50 mph? It's okay below those speeds. J. Mazzarella, Binghamton, N. Y.

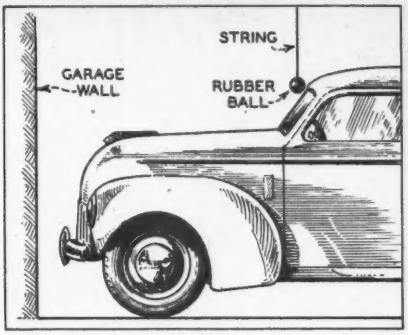
Generally speaking, high speed shimmy is caused by wheels and tires out of balance. Balance the wheels and let me know if you still have this trouble.

I have trouble starting my 1942 Plymouth when the motor is hot although I have no such trouble when it is cold. R. N. Evensen, Seattle, Wash.

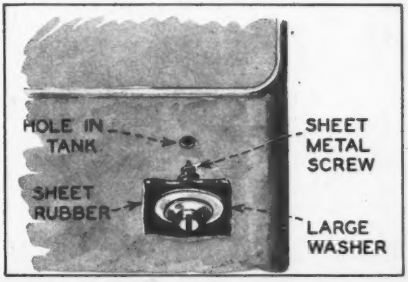
Difficulty in starting a hot engine may be due to over-rich vapor. Clear it by stepping on the starter with the throttle open but do not pump on the accelerator.

What causes my 1940 Chevrolet to "wander" over the highway? I have this trouble at practically all speeds. A. G. Apodaca, Socorro, N. Mex.

Wandering can be due to any one or a combination of the following conditions: incorrect caster, loose wheel bearings, defective shackles, shifting springs, looseness in the steering system, bent king pins, defective shocks, rear end misalignment. All of these factors should be carefully checked with your local mechanic.

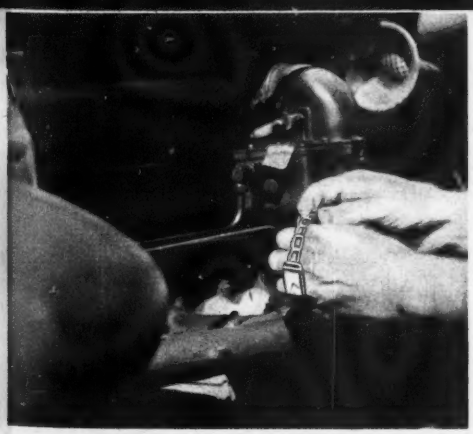


A ball suspended by a string will tell you just how far you can drive into the garage before bumping the wall. Below: A piece of rubber, a washer and a sheet metal screw, inserted in that order is a good emergency method of plugging up a leak in a gasoline tank.



Take that wrist watch off before starting any work over the motor. You can get a bad burn as the result of a dead short if the metal band of the watch comes in contact with high tension wire.

Hard starting may be due to an air leak around the intake manifold. Check for a broken gasket. Such an air leak will lean the gas mixture and lessen the efficiency of the choke.



do your pictures tell a story?

BY DON STORING

Simplicity, spontaneity, significance three touchstones to better pictures.

SOONER or later it occurs to almost every camera fan that his pictures aren't quite what they should be. His pictures, once so satisfying, no longer please him. "Heck" he may say, "my definition is good and my subject is just as striking as those magazine photos, what's wrong?"

Now this may be so. But do your photos have the appeal of those on the magazine pages? In other words, do your pictures tell a story?

"Well, how can I make my pictures tell a story?" you ask. Try the three "S's", Simplicity, Spontaneity and Significance.

Simplicity. The first "S" is easy. We all know that we should eliminate detail and strive for simple and

Here is a picture with a message that was improved through the use of a high camera angle. There is no distracting horizon to call attention away from the two men. It looks as though they were after a big one.

A good example of how props can be used to put a story across. This miss is stuck with the ironing again—and looks it. Top: An interesting photo because it shows something being done; low camera angle helped.

Since it was impossible to eliminate background in this shot, it was subdued by throwing it out of focus.

There is really no need to caption this particular photograph. It speaks for itself—a thousand words.

uncomplicated scenes or portraits. And here are some helpful hints on how to accomplish this.

First of all, choose straightforward subjects. For example, a close-up of Uncle Charlie biting into a hot dog is a simpler subject than the whole picnic area. Or, you can simplify the scene by removing unnecessary detail. Let us assume that you are shooting a story-telling picture at the beach. Pick up those scattered papers before you snap the shutter. The improved result will alleviate your aching back! In the case of portraiture keep the clothes subdued unless the ruffles and frills contribute to the result you seek.

Background simplification is the next logical factor to discuss. Suppose that Uncle Charlie is in front of a "busy" background of trees, you know the kind, with a branch growing out of Unk's head. How then to get the story on film and make it stand out? Choose a low camera angle. Instead of having a clutter of intertwining branches, you get a harmonious backdrop of clouds and sky.

Selecting a high camera angle will also improve your outdoor portraits. Don't photograph a lad beside a clapboard house, or leaning against a tree; use a high camera angle and have the beach, the lawn, or the lake as a plain background.

Unfortunately, physical conditions sometimes do not permit the photographer to pick a high or a low camera angle with the result that he has a busy background willy-nilly. Subordinate it then by throwing it out of focus.

Spontaneity. This is a little more difficult to obtain. There are many ways to secure this quality, one of which consists of hiring a model who always looks fresh as a daisy. However, most of us will try other ways. Paradoxically, spontaneity is gained by careful planning. For, contrary to popular belief, most of the photographs which look so casual, spontaneous and—well, downright accidental, were planned with a great deal of thought. Just look at all the publications around you; all those "easy" pictures weren't so easily made. If [*Continued on page* 158]

Photo Contest

MONTHLY PHOTO CONTEST RULES
Please put your name, address and picture-taking data on back of each print. Wrap with cardboard stiffeners and enclose a self-addressed stamped envelope for return of unused photos. Prize-winning pictures are not returned. Judges are MI Editors. Duplicate prizes awarded in case of tie. Photo Contest Editor, MECHANIX ILLUSTRATED, 347 Madison Ave., New York 17, N. Y.

1st Prize .....Frozen Rhythm
$10.00 to Irving Browning of New York for a bas-relief of Grand Central.

$5.00 Award .....'Twas the Night Before Exams
A time exposure by Kenneth Wagner of Ypsilanti, Mich.

$5.00 Award .....Silhouette
Leon Cantrell of Nashville, Tenn., captured this miss with a Rolleiflex, f-11, 1/50th of a second, no filter.

$5.00 Award .....Toil and Trouble
A Rollie and Verichrome helped John Makar of Detroit, Mich., record this appealing picture of his daughter.

battery box developing tank

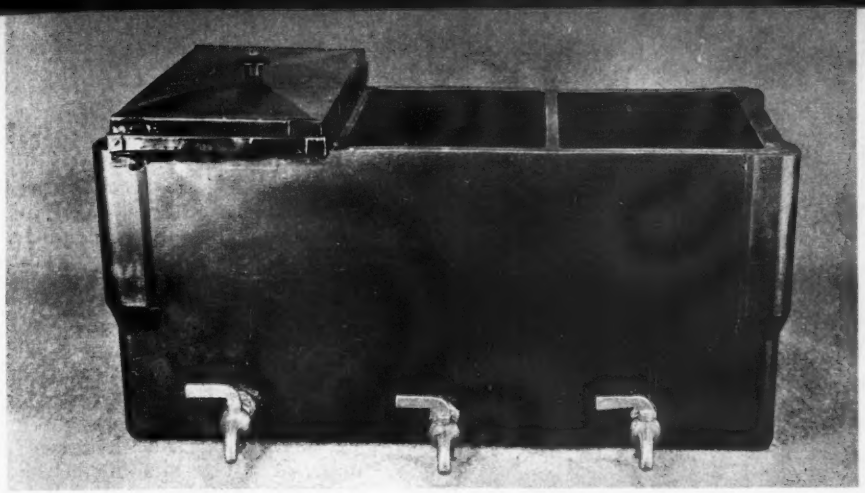
A light-tight processing tank that holds developer, rinse and fixer.

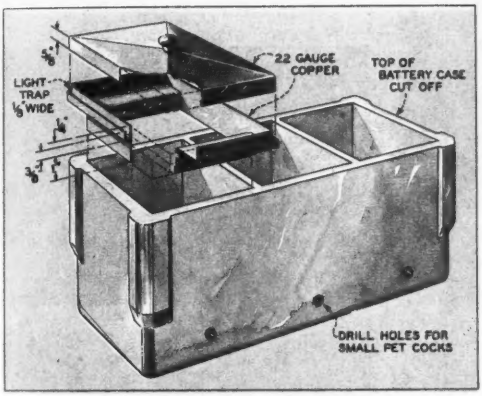
BY JACK MELLINGER

Top of the battery box can be cut off on a bench saw or with a hack saw.

MANY developing tanks for cut film have been made from old battery cases. Usually they are quite crude and lack the requirements for fast commercial work. Right now, however, new battery cases, surplus war stock, can be had for about $3.50. They are made of straight, high-grade rubber, easily worked into a commercial type tank. These boxes are designated as Navy Standard Battery Box, 9-S-4906-L.

If you use 5x7 in. cut film, the tank is of the right size; but for 4x5 in. film the tank should be cut down. This can be easily accomplished on a bench saw. Just set the saw for the depth you require and run the case through like a box. It cuts easily and does not injure the saw so that the cut is perfect. Or, you can do it by hand using a hack saw blade without the frame.





Finished tank showing the three pet cocks in place and light-tight cover.

Next, drill the side of each compartment close to the bottom for three small pet cocks. It is not necessary to thread the holes; the case material will thread itself, just start the pet cock into the hole squarely. The result is a tight, waterproof fit. These pet cocks of course allow the operator to drain the tank directly back into the solution bottles without any loss.

Ordinarily the tank could be used at this point but in commercial work the developing compartment must be light-tight. We will, therefore, have to make a light-tight cover for the developing compartment. It is made of No. 22 gauge copper, see the drawing for dimensions.

A coat of black auto enamel on the copper cover to prevent corrosion by the developing solution completes the tank. Now you have a commercial developing tank that will hold about ten film hangers and allow you to turn on the lights during the developing period.

THE QUESTION BOX

by Robert Brightman

Photo fans! Use this column for answers to any of your problems on photography. If the question involves a print fault please include the print with your letter (and postage for its return).

Where can I get the safety positive film mentioned in the story, Jiffy Slide Printer, featured in the August issue of MI. Lt. Thomas K. Ellis, Ft. Lewis, Wash.

The safety positive film referred to is known as P-402. A 100-ft. roll sells for about $2.00 plus taxes. You can order it from any large photo supply house.

Can I get a battery and motor to operate a 16mm movie camera? K. M. Carpenter, Houston, Tex.

Get in touch with the Eastman Kodak Company. They make a special battery-operated synchronized motor for their Cine-Kodak Special.

Can I use the positive film made for the Bantam camera in the Jiffy Slide Printer? J. Meyerson, New York City.

The film you bought for your Bantam is Direct Positive Film and cannot be used for slide-making as described in the above story.

How can I get life-size close-ups with my Super Ikonta camera? P. Zaleski, Cleveland, Ohio.

You will have to extend your lens to twice its own focal length by means of extension tubes to do this. Use a ground glass to examine the image as focusing is very critical with such a setup.

I have a Voightlander 9x12cm camera. Can you tell me what it was worth when new? C. C. Snyder, Endicott, N. Y.

The camera you describe was worth about $63 when new.

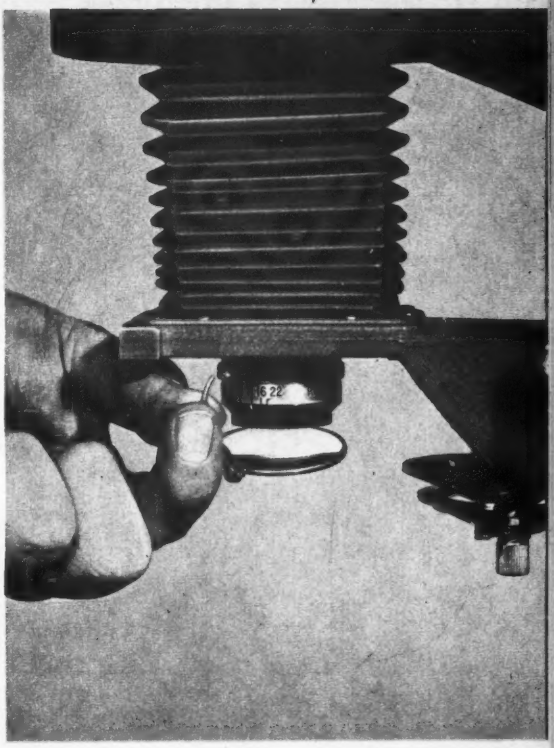
COPY-PROOF PROOFS can be made during the enlarging process by lettering the word PROOF or your name and address on a piece of cellophane. Place this on top of the negative and you will get the result shown at the left. This device effectively stops "copy" artists.

EASY EASEL. If you make most of your enlargements in one size you should appreciate this one. It is made of tin can metal with the edges turned over to form a channel for the paper. A thumb cutout, indicated by the dotted lines facilitates removal of the paper.

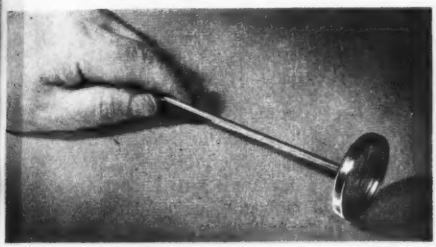
FILM DRYING. Clamp one end of the film with a film clip and suspend it from a hook screwed at some convenient spot in your darkroom. Now you can dry the film very easily by holding one end of it in your hand and passing a viscose sponge over the surface with the other hand.

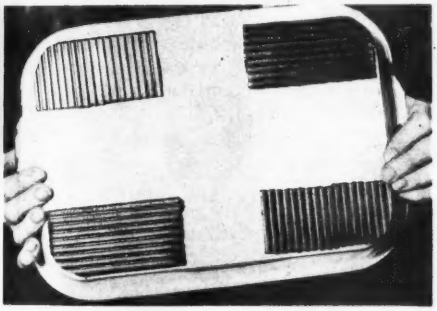
darkroom handies

ENLARGER SPECS. Instead of buying a lens of shorter focal length to get bigger enlargements, you can get the same result by slipping a spectacle lens over the enlarger lens. This reduces the focal length and will give you a larger image. Be sure to get a spectacle lens that *magnifies.*



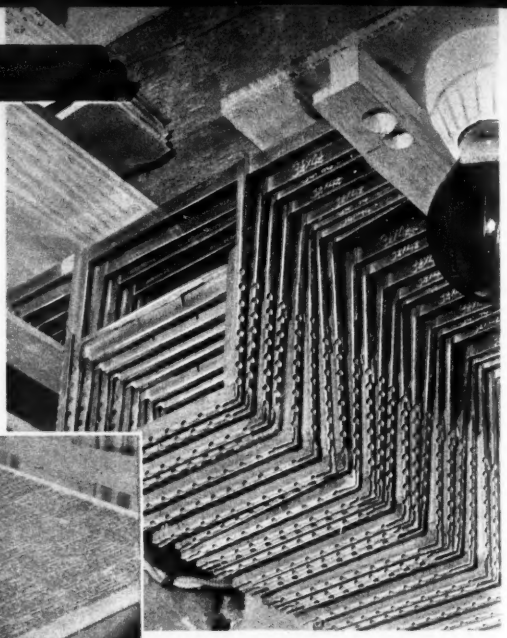
CHECKING THERMOMETER TEMPERATURE. The temperature of your photo thermometer can be quickly checked by holding it tightly in your hand for about two minutes. It should read 94°. Placed under the tongue it should register 98°. If it's higher you should go to bed or get a new thermometer.





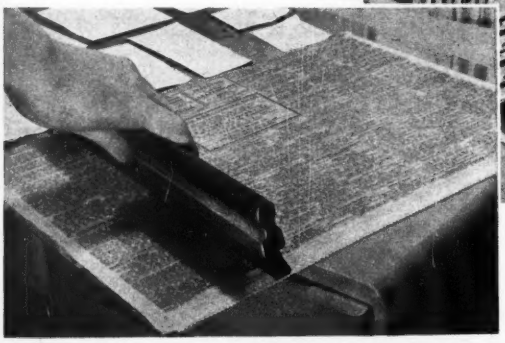
TRAY SAVERS. Prolong the life of your photo trays by cementing pieces of rubber stair tread at the bottom. It will also reduce clatter so the folks won't know what you're up to late at night.

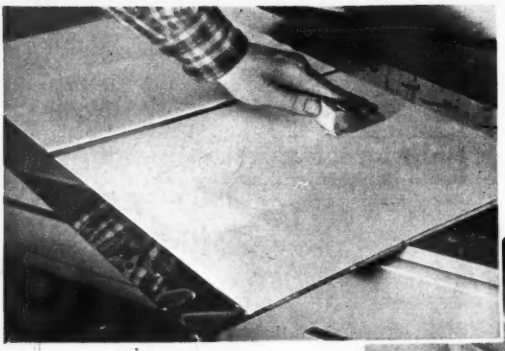
AVOID that dark, brown taste in your mouth when siphoning by getting a discarded bulb from a Packard shutter. With one end of the tube in the solution, start the siphon by squeezing the bulb and covering the end of the bulb to create the suction.



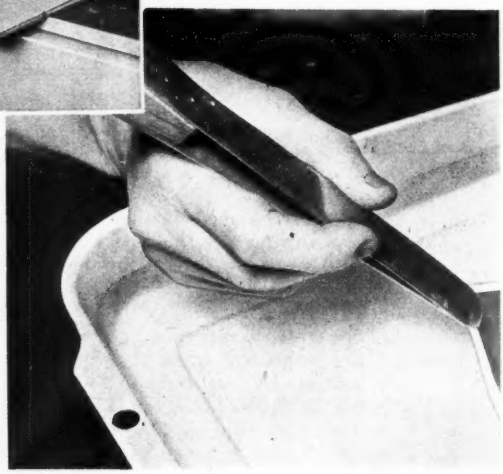
HANG 'EM. A convenient place for cut film developing hangers is a rack constructed against the ceiling of the darkroom. Here they will be able to drain dry and at the same time be kept free of dust.

The rack consists of two pieces of molding spaced far enough apart to accept the hangers.





FERROTYPING can be less of a chore if you follow these rules: Always place the plate containing the prints over several thicknesses of newspaper to absorb the overflow water. If you really want to get rid of moisture in a hurry, put a bath towel over the prints and then apply a roller before squeezing the prints down. Or, you can absorb the excess water with a viscose sponge as shown in the photograph, left.



PRINT TONGS. Stainless steel linoleum binding, available at chain stores and mail order houses for about 15 cents per yard, can be used to make a very neat, non-corrosive print tong. Round the edges with a file and then screw two pieces, each about six inches long, on each side of a small wooden wedge. If you like, you can flare the upper lip slightly, see right.

Evinrude announces the revolutionary new

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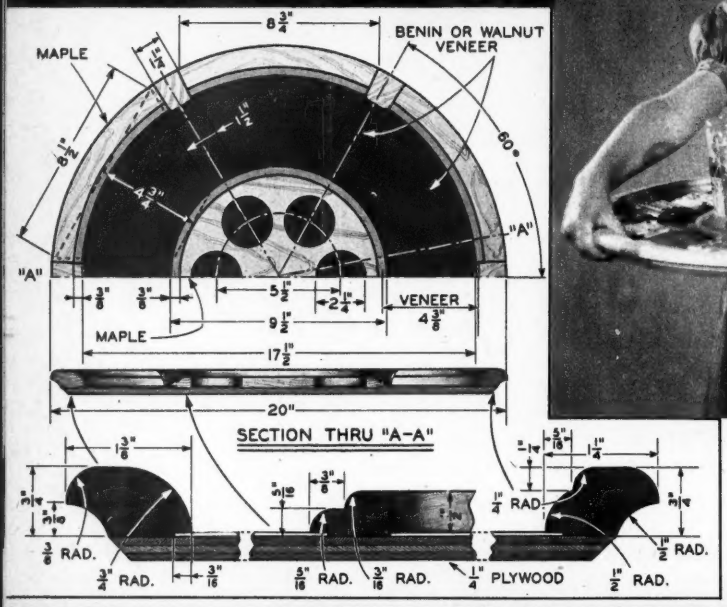
SNACK and BEVERAGE TRAY

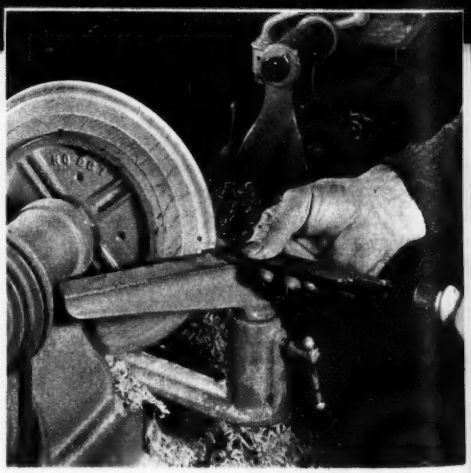
A silent partner to help put more life in your parties.



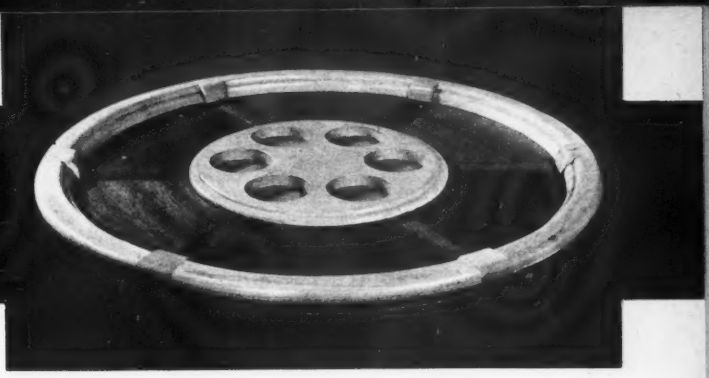
Construction of the tray is simple. Joints are easily made and adjusted without fuss.

Below: Assembling veneer pieces by pasting gummed paper over the joints. Veneer is cut by scoring several times with a thin knife.

Glass rack being turned. The moulding is cut on face plate side and raised table that remains is planed or sanded down later.



BY MILT EVANS



Veneer discs are glued in the bottom of glass holes.

UNLESS you're a professional juggler, serving food and beverages from the average tray is apt to be a problem. Just when the sandwiches are anchored fast, the glasses start sliding and if you're not careful the whole mess may wind up in Aunt Martha's lap. How can you avoid this trouble? The answer is simple—just make the tray that little girl's holding.

To start the ball rolling, cut out the six sections of veneer and 1½ in. strips that overlap the joints. They should fit fairly well but if you have to trim them do it with a plane, with the piece clamped between two boards. To assemble the pieces, use gummed paper over the joints and glue them to a plywood backing, using paper pads and heavy boards between the work and the clamps. When the glue is dry, sand the wood thoroughly and finish with spar varnish.

Your next step is to accurately cut the rim sections for shaping along the inside curve but leave the outside edges roughly oversize for later finishing. Scribe a guiding circle on the veneer and glue down the rim pieces. Next, turn the glass rack, drill the holes and glue it in place.

The rim blocks are then cut roughly to size and the sides fitted on a sanding disc until they wedge neatly in place. Next, mark the inner projections and trim to length, rounding the corners before gluing the pieces down. The outer edge of the tray is then shaped, using a pivot jig as shown in the photos. Following this, the rim is sanded and the tray given several finishing coats of varnish.

Using a circle cutter to drill holes in the glass rack. In turning this, the screw holes are located where the glass holes will be cut.

Trimming and shaping the edge using a pivot jig made by driving a nail through the center into a board. Feeding is started by tapping it.

Produce Your Own Honey

[*Continued from page* 129]

Subsequently, the bees draw this out on both sides, forming a comb with a wall in the middle. Note the sectional view of the top bar has a removable strip which is replaced after the wax foundation is positioned. The foundation is in this manner suspended from the top.

Full size supers, when filled with honey, weigh 60 to 70 pounds, too heavy for the average individual to manage. The amateur will find the shallow super more convenient in that they weigh, when filled with honey, about 30 to 40 pounds. Dimensions of the individual pieces of a frame are given in Fig. 7.

Shallow supers are made in two heights, one 4¾ in. for box sections, and the other 6⅝ in. for frames. The former is illustrated in Fig. 8. The boxes, section holders and beeway separators are best purchased for their cost is comparatively small. The function of the inner cover with bee escape is shown in Fig. 9. The comb honey is in boxes above and the bees, having filled them, come down into the main hive or brood combs, where eggs are laid and the young brought forth. Incidentally, the frames are so constructed that, when filled with comb honey, there is space for movement of the bees. Through these passages, which are about $\frac{5}{16}$ in. wide, the bees direct air currents by fanning with their wings, thus creating an air conditioning system that prevents the combs from melting down in hot weather.

The best time to begin keeping bees is in the spring when fruit trees are in bloom. As previously stated, bees are purchased in two or three pound packages and including a queen. Full instructions for introducing bees and, separately, the queen, come with the package which may be purchased from any reliable bee concern. The I. R. Root Company of Medina, Ohio, is one of the largest. Until they are able to store up sufficient honey and pollen for themselves, it will be necessary to feed your bees a syrup made of one part water and one of sugar. The sugar should be added to the hot water very slowly.

The best place for a hive is in an orchard, where bees can reach the blossoms even when weather is unfavorable. However, too much shade is not good for the bees; just enough to shade the hive from the sun during the hottest part of the day. The hive should also be protected from strong winds, especially in winter, and a row of trees or high hedge is an advantage. It is interesting to know that bees have been kept successfully on buildings in the heart of New York City, foraging in Central Park. As long as they are within one to two miles of white, alsike and sweet clover, alfalfa, sage, orange, tupelo, raspberry, blackberry, sumac, mustard, basswood, willow, maple, tulip tree, golden rod, milkweed, etc., they will serve you well. And there should be a ready supply of water such as pond, stream or even lily pool.

Having equipped yourself with bee veil, long-sleeved gloves bound around your lower arm, a thick jacket and your trouser legs tied, you are ready to take the first honey from the super. With a thin hive tool the cover is pried up just enough to admit smoke but not enough to let the bees out, Fig. 10. After a few puffs of smoke the bees will go down between the combs. Lift off the cover and take out a frame for inspection. If it appears well filled with honey, replace it with a fresh frame and wax foundation. Proceed to take out others, replacing those filled. However, leave two or three filled combs in unless the main hive below appears to be well filled with honey, sufficient to last until the next season. The robbing, of course, should not take place until after the flow of nectar (which the bees make into honey) is over, that is, when there are no more blooms in your area. Empty comb space should exist in the hive at all times preceding and during the honey flow.

While removing full frames and replacing others the smoker will be needed frequently. If the smoke doesn't do the trick, the bees on the combs can be removed with a soft brush, the frames then placed in a tub for extracting.

One of the handiest pieces of extracting equipment for both novice and commercial apiarist is the centrifugal extractor, in which frames are secured about an axis and the honey thrown out as the frames are whirled around at high speed. Without this type extractor, however, the beginner can manage to separate honey from the comb by simply laying the uncapped comb on a grill over a tub and mashing with a large spoon. The residue, still containing considerable honey, is then placed in a cheese cloth bag and the neck twisted, Fig. 11. The honey itself is next strained through a moist cheesecloth in an open box over a tub, as shown in Fig. 12, and run through a second time to remove all foreign matter.

Before extracting, the wax cap of the comb must be removed. This is done by balancing the frame on a nail in a board across a tub as shown in Fig. 13. Heat a knife in boiling water and, with a sawing motion, cut the wax cap off.

A bee veil can be easily made, and consists of a cloth top and draw-string to tighten around the crown of a hat, Fig. 14. The hive tool is a flat piece of steel sharpened at one end and bent at the other and is used for separating frames. It will be found useful in many ways. The smoker consists of a can containing oily rags and a bellows. Their cost is slightly more than one dollar.

Feeders for starting and for winter can also be homemade, Fig. 15, although their cost is little. For successful wintering a colony should have a young queen of high producing stock, a large cluster of young, fall-raised bees, 60 or more pounds of sealed honey and several combs containing large areas of pollen. For these requirements a colony with a two-story standard hive should weigh about 130 pounds, in October.

● *Our hobbyist is using a scroll saw. Other Delta Homecraft tools include: lathe, saw-jointer, band saw, drill press, and sander.*

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Boats and Boating

[*Continued from page* 121]

with this method is that with long deck beams having a flat crown, the radius required may be 40 ft. or more and in the average workshop there just isn't that much room.

The second method illustrated in Figure 2, is much easier to use. With this, two pieces of straight-grained wood, each longer than the maximum beam of the boat, are clamped together so the upper vee where the ends cross is exactly over the mark at the top of the crown. Where the curve runs through the ends at the sheer (or at each end of the beam), a nail is driven part way into the material. The two pieces are then adjusted so that the vee is exactly at the centerline and with their upper sides touching the two nails. By clamping a pencil at the apex and moving the rig back and forth, the exact crown can be drawn without any guesswork. Loosening the clamps and changing the angle of the pieces, makes it possible to draw in the crowns of the remaining beams. In using this method, be sure to keep the edges of the wood pieces in contact with the nails at all times. If this isn't done, the curve won't be true and will have to be redrawn. After one line has been drawn on a beam, move the nails down to the depth of the beam shown on the plans, and repeat the process previously described. This will mark the top and bottom edges of the beam and makes it easier to band saw it to shape.

After all the deck beams have been cut and are ready to be set up in the hull, there are a few points to watch. Most important of all is to keep checking the centerline to make sure there are no bumps or hollows. If the centerline of the deck is straight from the widest point to the stem, set up the widest beam first and then stretch a piece of string from the center of that beam to the stem. As the remaining beams are installed, they should just touch the underside of the string. On some boats, the crown makes a fore-and-aft curve from the widest point to the stem. Here again set up the widest beam first, followed by one or two others well spaced. Then bend a batten from the widest one to the stem and check to make certain that it describes a fair curve. If there's a high or low spot, recheck the crowns of the beams and replace any that are incorrect. This may seem like an unnecessary chore but it's a lot easier than trying to "live with" a boat the deck of which looks like a roller coaster.

In cases where a deck house requires the use of short beams for most of the boat's length, draw out the deck as though the house weren't there and get the maximum crown for the beams. The curves are then drawn in the usual way, using only enough material to make up the short beams. On most small cruisers, the beams for the narrow decks on either side of the house have the same crown from amidships to the stern.

Do Your Pictures Tell a Story?

[*Continued from page* 146]

they were, everyone would be an advertising photographer—and heaven forbid that.

If you run into the problem of stiffness after posing a subject for a long period of time, try a few tricks to make him relax. With adults, you can ask your model to turn away from the camera, moisten his lips and then turn back to you looking as though he'd never seen you before in his life.

With children the problem is quite different. You may have to cajol them into moods for the best pictures. This is often done by allowing them to wander around between takes, by giving them a favorite toy to play with, and—this is important—letting them stay in familar surroundings while the picture-taking process is going on.

Higher shutter speeds are of great assistance in securing spontaneity. The use of a fast pan film such as Ansco Superpan Press or Eastman Super XX will permit these higher speeds, even under unfavorable circumstances.

Significance. And now for the last "S." This is perhaps the most misunderstood quality for significance can spring from many sources. Suppose you stand a grizzled character beside a hay wagon under a lowering sky, then you shoot the picture as he dead-pans into the camera with his hand on his pitchfork. What does the photograph mean? You're right—nothing!

But if you took that same character by the same hay wagon and instruct him to squint at the stormy sky, perhaps scratching his head, you have a story. He is wondering how long he has to get to the barn with his hay before it rains.

An act in progress can be meaningless or meaningful. For example, take the same farmer, the same hay wagon and a team of horses. Have them run toward a barn in the background on a sunny day, and you will get a, "so what?" But place the farmer on the wagon racing under black clouds to get to the distant barn, and you have a story. He doesn't want the hay to get wet before he gets there, and even city slickers will catch on.

If the same character were photographed just inside the open barn door gazing out into the downpour, the subsequent picture would have little significance. But if the subject were sprinkled with a few drops of water on his shoulders, with a little dabbed on his forehead to represent perspiration and he were then photographed as he smiled and mopped his forehead with a bandana, the story would be apparent. He was happy because he beat the shower and got the hay safely into the barn.

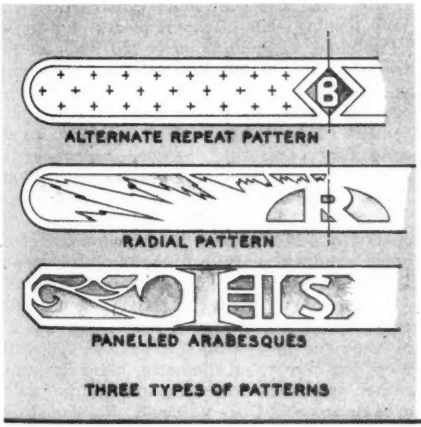
Study the illustrations on pages 144, 145, and 146 and see how a story was told in each case. Check over your old prints. How many really tell a story? And wouldn't it have been easy to improve them with a little imagination and ingenuity? Make up your mind that you are going to incorporate a message in your pictures from now on—you'll find that it will give your prints the punch that makes them pay off.

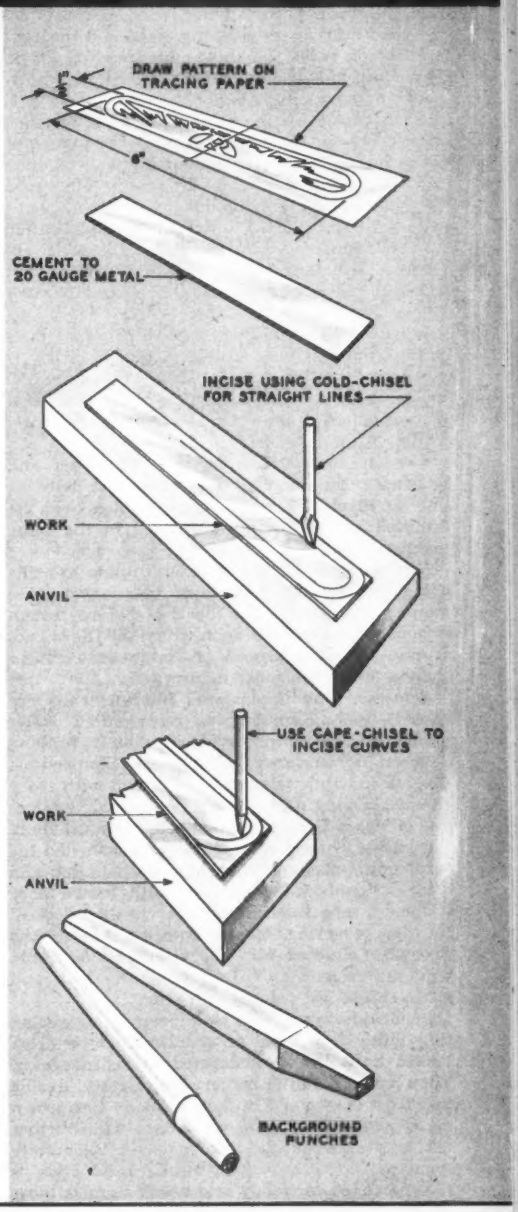
making bracelets

Hand embossed jewelry that can be completed in an evening.

THESE three examples make an interesting metal project for the beginner and a welcome gift for the distaff side of the family. Almost any metal that can be cold worked may be used and while only the "B" pattern is described, the same methods apply to the other designs.

The drawings will give you all the details of the different operations. In following them, be sure the metal is held flat against the anvil and avoid cutting through the blank. For the background behind the initial, use a stipple or prick punch. The blank is then cut and filed to the exact shape, followed by smoothing with 3/0 emery cloth and pumice paste. The bracelet is hammered to shape from the back, using a ball peen hammer and wood matrix. Potassium sulphate is used to darken the metal, followed by a pumice rub on the highlights and a buffing. Lacquer or tin on the inside will prevent discoloring.





Modern Home From Mud

[*Continued from page* 134]

accommodate rock lath, Fig. 20. The bracing of the roof structure is illustrated in Fig. 18. This method not only supports the long rafters in the middle but resists end-to-end or gable-to-gable pressure under strong winds.

In all rooms except living room the joists are installed first, directly on the plate, and the ceiling boards nailed on the underside, Fig. 19. In bedrooms, hall and kitchen this is shiplap knotty pine, in the dining room random width T & G oak. A cornice of the same material is installed in every room covering the edge of the plate. None is used in the bathroom as the walls and ceiling are plastered, the former directly upon the adobe brick without metal lath or other retaining device, Fig. 20. Incidentally, the built-in bath tub must be installed before the walls are laid up. All other fixtures can be installed later, although concealed piping should be in place before brick laying is started.

Woodbox. The woodbox is of shiplap pine built against the wall and fireplace, Fig. 21. Fuel is passed in from the outside. Heavy plank sheathing prevents damage to the pine walls. Sills, 2x4 in., are bolted to the floor; see the enlarged view in Fig. 21 for details.

Fireplace hood. This is made of copper and secured to the masonry with expansion bolts set into the mortar. The pilasters or facings over the firebrick are also copper, secured in the same manner, Fig. 22.

Kitchen sink. A cabinet is built up on 2x4 sills anchor-bolted and framed in the conventional manner, except that the top is a shallow trough to hold the tile cement upon which the tile is laid, around the sink proper. A large drawer and shelves are dimensioned as necessary.

Painting. The unplastered interior walls are painted with Kemtone, as ivory-tinted water paint. One application covers completely, yielding pleasant, light interiors. The pine kitchen ceiling, shelves and sink cabinets are finished with ivory enamel. Living room ceiling, beams, oak cornices and all doors are oiled to show their natural grain. The inside of the bathroom door is enameled the same as the plastered bathroom wall. In lieu of a wooden baseboard, paint one with brown floor enamel, a tone that harmonizes with the asphalt tile floor covering, see the interior shots in the February issue of MI. The redwood doors and windows frames are oiled while the sash and gable siding are painted tile red.

In conclusion you may be interested in knowing that quite a number of stabilized adobe brick homes have been constructed in recent years. They have proven to be very satisfactory, livable and most charming. In fact, a colony has grown up in Carmel, California, where most of the homes use this type of building material. Generally speaking, however, adobe brick construction is recommended for fairly arid areas, such as those which prevail west of Kansas.

Know Your Circuits

[*Continued from page* 135]

same battery post (post E), and wires C and D to the other post (post F), the left-hand switch controls *only* the dome light, and the right-hand switch *only* the headlights. In actual practice, post E of the battery (in some cars the positive, in some the negative) is connected to the nearest part of the car's chassis, this connection being called a "ground"; the wires A and B are likewise attached to the chassis, so the whole body of the car acts as one side of the electrical circuit.

No discussion of electrical circuits would be complete without special mention of that annual headache of the family handy man, Christmas tree lights. The reason these are such a nuisance will be found in Fig. 4A and 4B. The usual low-priced string of lights consists of eight bulbs, but unlike most other lighting items, these bulbs are connected in SERIES, as indicated in Fig. 4A. The bulbs are designed to work on about 14 volts each, so the eight of them in series light up just right on the "110-volt" house circuit, which may run from 105 to 115 volts. The shortcoming of this arrangement is that *all* the bulbs go out if any *one* of them should burn out, as shown in Fig. 4B, a burned out bulb being equivalent to an open switch. Finding the culprit is simply a matter of trying a new bulb in each socket.

P-47 Thunderbolt

[*Continued from page* 140]

Mount your engine, cutting away the cowl section to fit the cylinder and timer and attach dress snaps for holding the section in place. The position of the battery (Vitamite wet cell or the Bright Star No. 459) is indicated on the plan. Should your model be slightly nose heavy, move the battery back until the model balances at a point ⅓ back from the wing leading edge. Hold the battery in place with rubber bands.

The wing is of semi-solid construction with a solid leading edge. Cement pieces of 2 in. wide $\frac{1}{16}$ in. stock together to cover the wing width up to the spar. Cut the outline, allowing about ⅛ in. for final trimming. Using the front view plan, cut the tapered spar from hard ¼ in. stock and cement to the lower surface covering, working on a flat board. Add the gear brace and then cement the ribs to both the spar and the sheet bottom. Remove the structure from the board.

Now that the model is assembled, apply two coats of wood filler and about two coats of clear dope, sanding carefully between each application. The regulation color scheme is pure silver.

Balance your model and test fly from a smooth area, using 20 ft. lines. A runway, tennis court or even the gymnasium of your school will be ideal, for the wheel diameter, being to scale, is rather small and makes a bump-free take-off area necessary. Once adjusted, you can fly your 'Bolt to your heart's content!

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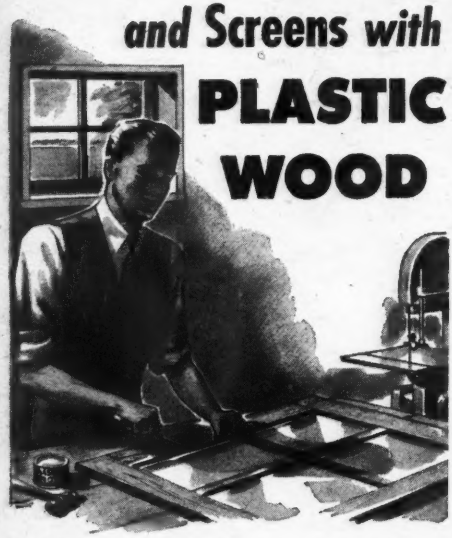

When making new screens, or replacing old rusted screen, apply thin layer of PLASTIC WOOD around frame after tacking down screen. This gives greater strength to the frame. PLASTIC WOOD can be easily shaped to match broken molding. Valuable in replacing rotted wood in storm windows.

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A CELLULOSE FIBRE FILLER

Cosmic Ray-Gun

[*Continued from page* 63]

of invisible, soundless bullets would pass through living tissue, breaking down its cells irreparably. Under intense radiation people might die within a matter of minutes. Under reduced radiation they would contract radiation sickness, which brings a slower, lingering death.

The worst thing in this picture of cosmic ray warfare is the fact that such lethal guns would require no huge plants such as are necessary for atomic bomb production. They could be manufactured secretly. Every manufacturer of heavy machinery and radar equipment could turn them out. Controls would therefore be very difficult to enforce.

The interstaller origin of the bombarding cosmic rays has been proven by extensive experiments conducted by Prof. Robert A. Millikan, of the University of California, and others. These research workers took Geiger-Mueller radiation counters to all parts of the world and found, by placing the equipment in various positions, that the rays were subject to bending by the earth's magnetic field. Near the Poles they came from straight above, with very few coming in from the sides; but in the middle latitudes most of the rays come in at an angle coinciding with the lines of the magnetic field.

Since this field extends some ten thousand miles beyond the atmosphere, it is obvious that the cosmic rays have no terrestrial origin.

But scientists still know little about the manner in which cosmic rays originate.

The most logical theory offered seems to be one based on Einstein's famous equation. It is that a process of annihilation or self destruction of atoms at rest is constantly going on. An analysis of the atoms in the most abundant elements in far-away space, such as boron, carbon, nitrogen, oxygen, aluminum and silicon shows that if they split apart and suffer no loss in energy while traversing space on their way to the earth, one half of the break-up energy corresponds to the exact values registered on earth. These average between five and 14 billion electron volts. The other half of the energy would be shot away in the opposite direction in accordance with Newton's third law of motion, which states that for every action there must be an equal and opposite reaction.

So, digging behind the scenes of cosmic ray investigation, we find that physical laboratories all over the world are busy sending up rockets and airplanes with Geiger-Mueller counters and other cosmic ray equipment in a determined attempt to find out what the rays are like at extreme altitudes.

If meson bombardment is part of some atomic process, scientists want to know how the triggering rays manifest themselves above the atmosphere.

All of this knowledge will later be applied to the development of the cosmic ray-gun.

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Going Up!

[*Continued from page* 67]

In rope tension climbing, the first man drives a piton as high as he can above him. A snap ring is hooked into the piton and the rope passed through it. The second man, who must be securely placed, preferably tied to the rock, now takes in slowly on the rope. The first man, leaning outward against the rope, and wearing rubber-soled shoes, is thus enabled to walk up even a vertical face, until that part of the body to which the rope is secured is level with the piton. He then drives another piton higher up, and repeats the process. In order to get more distance with each piton, the climber usually secures the rope around his waist.

A refinement of this method uses two ropes, the climber leaning against one while he places the other.

When the first man reaches a secure position, he belays the rope above so that other members of the party may follow.

The same principle may be used to make a horizontal traverse over an otherwise impassable face. By passing a rope through a piton above, it is possible to lean out against the rope and walk horizontally a considerable distance.

On a steep face or slope it is always easier and quicker to climb than to descend, unless the party rappells, or ropes down. In rappelling the rope is secured above by a rope sling around a projecting rock, or a piton. In either case, it is well to pass the rope through a snap ring for easier running. A double rope is usually used, so it may be pulled down by the last man. If it is desired to use the full length of the rope, the end should be secured by a large knot, a piton, or a stick, so it will not be pulled through the ring. Or a bowline may be tied at the upper end, the lower end passing through the ring and loop.

The rope is passed under one leg, around the hip, across the front of the body, and over the opposite shoulder. The friction of the rope against the body, and the weight of it below, will hold the climber securely without use of the hands. To descend, the rope is fed by one hand in front and the other behind, walking or bounding backwards with the feet at any speed suitable to the climber. One may also come down a sheer cliff, with the feet entirely free, with perfect safety.

To overcome the slight danger of upsetting when the feet are not in contact with the face of the slope, a short line may be passed around the waist, with a snap ring in front, through which the upper lead of the rappell rope is passed.

If much rappelling is expected, extra rope is usually carried so that the whole party need not wait at each stage of the descent.

Footgear should be suited to the type of climbing expected. Smooth-soled leather shoes are dangerous. Hobnailed shoes are used over all terrain except steep rock faces or slabs, which require crepe-rubber soles and flexible uppers.

Crampions, an arrangement of spikes which strap over the shoes, are needed for safety on ice.

Now *Marlin* takes the MYSTERY out of BLADE buying!

"What's the best blade to shave with...the 30-Second Marvel, the Hyper-Honed, or the one that wows the ladies?"

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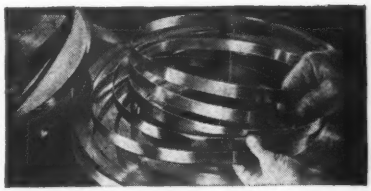
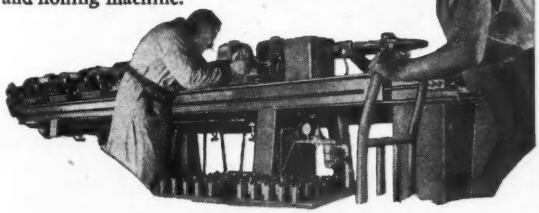
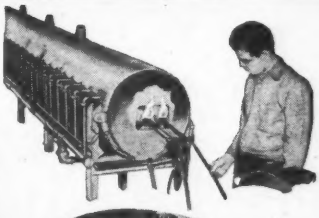
Steel The best for blades is "high carbon," alloyed with chromium according to scientific analysis. Marlin has worked in steel for 75 years.

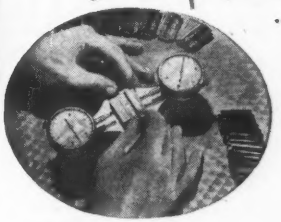


Tempering makes steel hard and tough. From bulky ingot to ribbon-like strip, blade steel is heat-treated again and again. Final tempering "sets" the metallic structure to take a sharp tough edge.

Precision manufacture requires complex machinery—which produces blades with finer, keener edges...more uniformly perfect...than is possible by hand. Photograph: Marlin grinding and honing machine.







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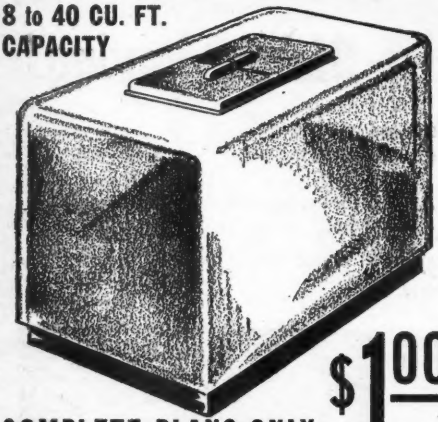

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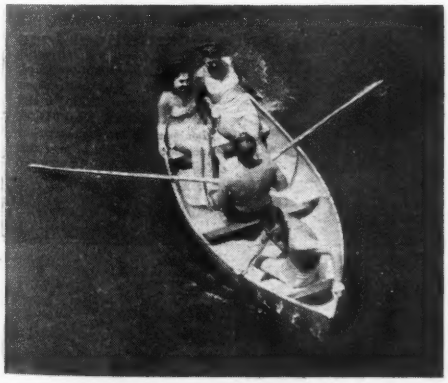

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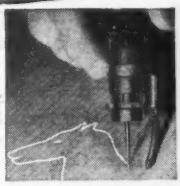

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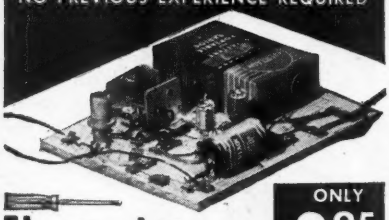

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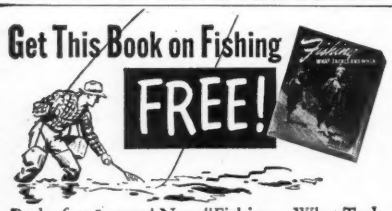

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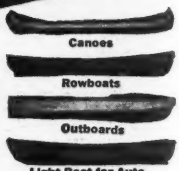

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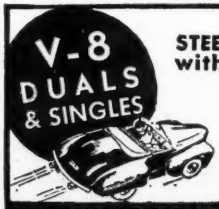

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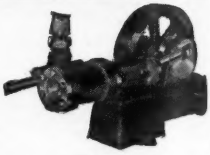

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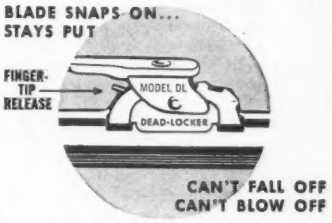

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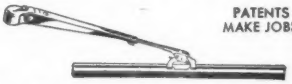

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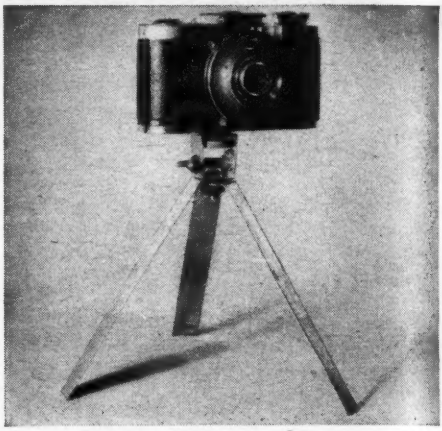
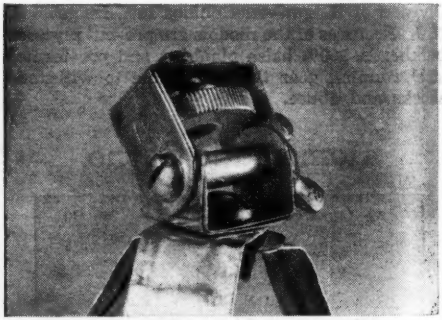
Tilt-Top Pocket Tripod

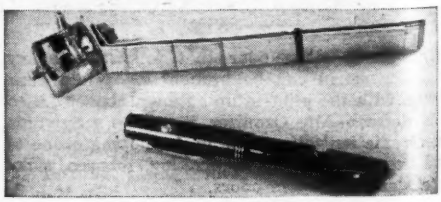


Not much bigger than a fountain pen, this handy little folding tripod, incorporating a tilting device, offers a rock-steady support to your miniature camera.

It is made entirely out of scrap metal, plus a thumb screw for the camera tripod socket, a 3/16x1¼ in. bolt and wing nut, and a ¼x⅝ in.



bolt and square nut. All of the important construction details are shown in the center photograph. The legs are ¾ in. wide by 5¾ in. long. This does not include the ⅞ in. flange which is bent to an angle of 55° at the top of each leg. A ¼ in. hole is cut in the center of the flanges for the bolt which fastens the tilting unit to the tripod proper. The tilting top consists of two U-shaped brackets which are held together by the 3/16x1¼ in. bolt.



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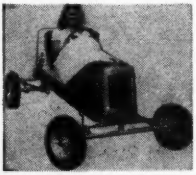

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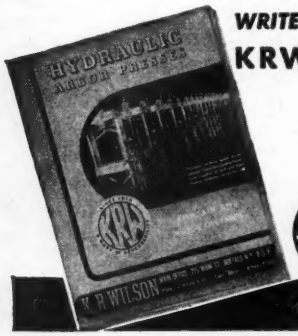

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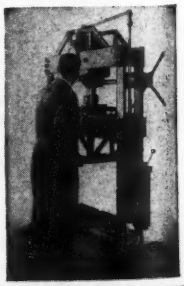

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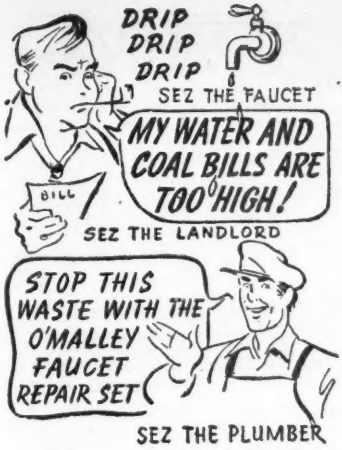

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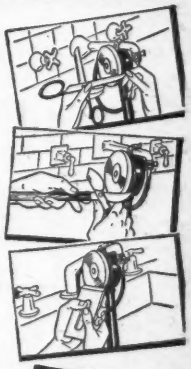

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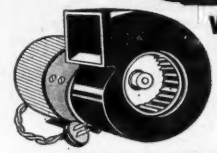

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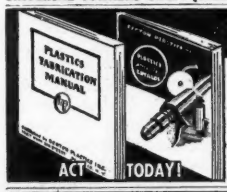

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AZ50	5.00	4.75	1/2, 5/8, 3/4, 1	.87
AZ60	6.00	5.75	1/2, 5/8, 3/4, 1	1.13
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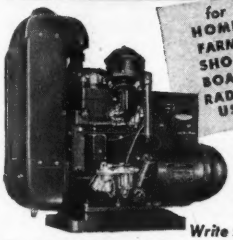

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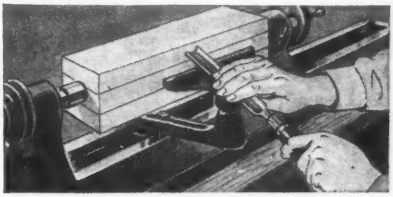

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Choose pieces of stock to roughly approximate finished size and shape. Plane surfaces to be glued so that they are perfectly smooth. Spread a thin film of CASCAMITE on the surfaces to be glued. Clamp and let set (at 70°F. or warmer) until glue is hard.

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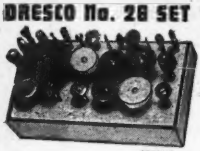

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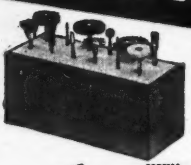

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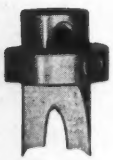

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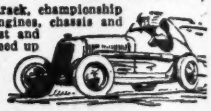

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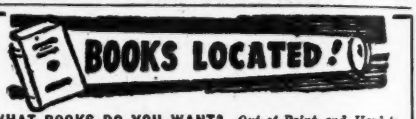

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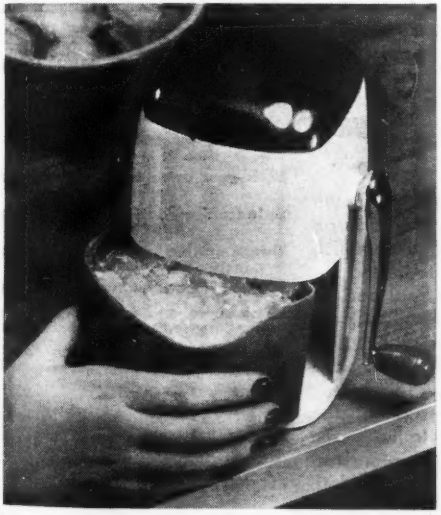

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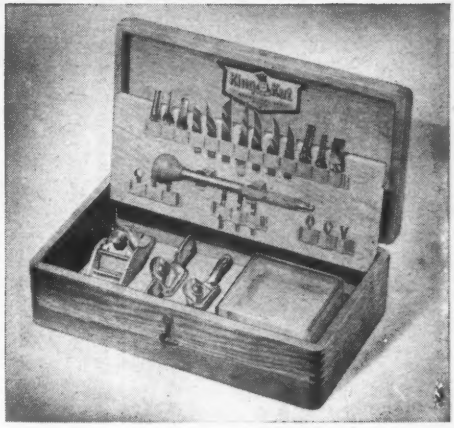
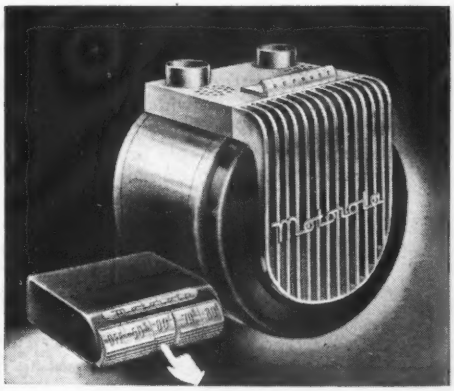


King Kut Treasure Chest is the name of this answer to the carving fan's prayer. Containing a total of 28 pieces, the natural finish chest has everything the hobbyist needs for his wood carving projects. There's a scientifically designed tool holder with a bull-dog grip handle and a special tapered chuck which locks and holds any one of the 22 cutting edges supplied. In addition, there are two aluminum spoke shaves, one for flat surfaces and the other for curved cut outs, plus a specially designed grinding and honing stone to keep all of the cutting edges sharp. The chest is made by the A. P. Parts Corp. of Toledo.



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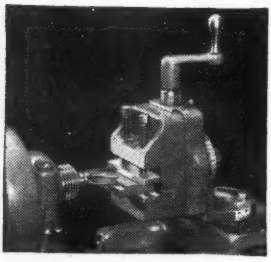

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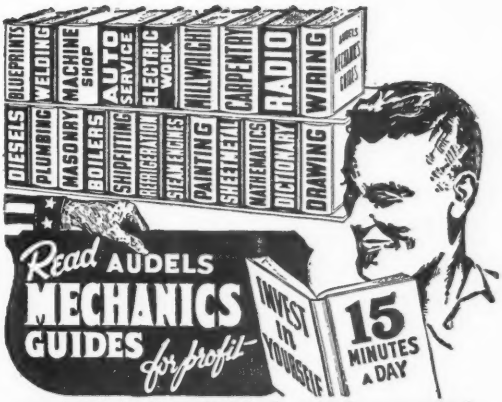

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